Department of Defense

DoD DEPARTMENTS/AGENCIES:

Department of the Army

Department of the Navy

Department of the Air Force

Defense Advanced Research Projects Agency

Defense Nuclear Agency

Strategic Defense Initiative Organization

DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR)

FY 1990 SBIR SOLICITATION

PHASE I AWARD ABSTRACTS

NAVY PROJECTS

VOLUME II

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PREFACE

This report presents the technical abstracts of the Phase I proposals resulting in contract awards in Fiscal Year 1990 that were submitted to the Department of Defense (DoD) Small Business Innovation Research (SBIR) Program. The Army, Navy, Air Force, Defense Advanced Research Projects Agency (DARPA), Defense Nuclear Agency (DNA), and Strategic Defense Initiative Organization (SDIO) are the DoD components of the SBIR Program. Two solicitations inviting small business firms to submit proposals under this program were published in FY90. All six DoD components participated in Program Solicitation 90.1 (Closing Date: 5 January 1990), and Army, Navy, and DARPA participated in Program Solicitation 90.2 (Closing Date: 2 July 1990). The selection of proposals for funding was made from proposals received by the Military Services and Agencies.

FY 1990 SBIR PROGRAM

	Number of Topics		Proposals Received		Phase I Awards	
	90.1	90.2	90.1	90.2	90.1	90.2
Army	206	273	2482	2094	218	272
Navy	310	78	2132	520	334	78
Air Force	199	--	2524	--	233	--
DARPA	61	70	754	563	94	85
DNA	17	--	254	--	16	--
SDIO	15	--	710	--	97	--
Total	808	421	8856	3177	992	435
Grandtotal	1229		12033		1427	

Of the 1427 Phase I awards made in 1990, 180 awards went to minority-owned businesses and 113 awards were to woman-owned businesses. Overall, 11.9% of 1990 SBIR proposals were selected for funding, that is better than a 1 in 9 chance of receiving an award.

In order to make information available on the technical content of the Phase I projects supported by the DoD SBIR Program, four volumes containing the abstracts and contacts for the 1427 awarded projects are published. The small business information with accompanying abstract are arranged in topic number order. When more than one award was made for a given topic, the information is in alphabetical order by firm.

- Volume I contains Army Projects
- Volume II contains Navy Projects
- Volume III contains Air Force Projects
- Volume IV contains DNA, DARPA and SDIO Projects

Venture capital and large industrial firms that may have an interest in the research described in the abstracts in this publication are encouraged to contact the firm whose name and address is shown.

In 1982, Congress enacted and the President signed the "Small Business Innovation Development Act of 1982" (Public Law 97-219), which created the Small Business Innovation Research (SBIR) Program to give small, high-technology firms a greater share of the federally-funded research and development contract awards.

Under the SBIR Program, each federal agency with an extramural budget for research or research and development in excess of $100 million per fiscal year must establish an SBIR Program. The program is funded by setting aside 1.25 percent of the participating agency's extramural R&R&D contracting dollars. The agency's participating in the Department of Defense SBIR Program are Army, Navy, Air Force, Defense Advanced Research Projects Agency (DARPA), Defense Nuclear Agency (DNA), and Strategic Defense Initiative Organization (SDIO).

The objectives of the DoD SBIR Program include stimulating technological innovation in the private sector, strengthening the role of small business in meeting DoD research and development needs, encouraging participation by minority and disadvantaged persons in technological innovation, and increasing the commercial application of DoD-supported research or research and development.

The SBIR Program consists of three distinct phases. Under Phase I, DoD Components make awards to small businesses, typically of up to one man-year effort over a period generally of six months, subject to negotiation. Phase I is to determine, insofar as possible, the scientific or technical merit and feasibility of ideas or concepts submitted in response to SBIR topics. Proposals selected for contract award are those which contain an approach or idea that holds promise to provide an answer to the specific problem addressed in the topic. Successful completion of Phase I is a pre-requisite for further DoD support in Phase II.

Phase II awards will be made only to firms on the basis of results from the Phase I effort, and the scientific and technical merit of the Phase II proposal. Proposals which identify a follow-on Phase III funding commitment from non-Federal sources will be given special consideration. Phase II awards will typically cover two to five man-years of effort over a period generally of 24 months, also subject to negotiation. The number of Phase II awards will depend upon the success rate of the Phase I effort and availability of funds. Phase II is the principal research or research and development effort, and requires comprehensive proposal outlining the intended effort in detail.

Phase III is expected to involve private sector investment and support for any necessary development that will bring an innovation to the marketplace. Also, under Phase III, DoD may award follow-on contracts not funded by the SBIR Program for products or processes meeting DoD mission needs.

Proposals received in response to a DoD solicitation are evaluated on a competitive basis in the organization which generated the topic, by scientists and engineers knowledgeable in that area. Selections for Phase I are made in accordance with the following four criteria:

- The scientific/technical quality of the research proposal and its relevance to the topic description, with special emphasis on its innovation and originality.
- Qualifications of the principal investigator, other key staff, and consultants, if any, and the adequacy of available of obtainable instrumentation and facilities.
- Anticipated benefits of the research to the total DoD research and development effort.
- Adequacy of the Phase I proposed effort to show progress toward demonstrating the feasibility of the concept.

Public Law 99-443, the "Small Business Innovation Act of 1986" was signed by the President on October 6, 1986. This law re-authorized Public Law 97-219 (signed July 22, 1982) to extend the "Sunset Clause" to 1993; to continue 1.25 percent taxation of the extramural research and development budget; and excludes from taxation those amounts of the DoD research and development budget obligated solely for operational systems development.

CORTICON INC
3401 MARKET ST - STE 330
PHILADELPHIA, PA 19104
Program Manager: PETER CHANCE
Contract #:
Title: ASSEMBLY OF A PROTOTYPE NEURAL ANALOG COMPUTER
Topic #: N90-001 Office: ONR ID #: 41149

THE OBJECTIVE OF THIS PROJECT IS THE DEVELOPMENT OF A PROTOTYPE GENERAL PURPOSE ANALOG NEURAL COMPUTER. THE MACHINE IS INTENDED FOR REAL TIME, REAL WORLD MASSIVELY PARALLEL COMPUTATIONS SUCH AS HIGH SPEED OPTICAL AND ACOUSTICAL PATTERN RECOGNITION, ROBOTICS AND THEE DEVELOPMENT OF SPECIAL PURPOSE NEURAL NETWORKS. THE COMPUTER WILL BE BUILT FROM VLSI MODULES DEVELOPED AT THE UNIVERSITY OF PENNSYLVANIA. IT IS SCALABLE TO ARBITRARY SIZE AND EVEN AT MODERATE SIZE, ITS EQUIVALENT COMPUTATIONAL POWER AND SPEED WOULD EXCEED BY MORE THAN 4 ORDERS OF MAGNITUDE THOSE OF ANY CURRENTLY AVAILABLE DIGITAL COMPUTER. THE RESEARCH WILL FORM THE BASIS FOR THE CONSTRUCTION OF A LARGE SCALE MACHINE AND THE DEVELOPMENT OF MILITARY AND COMMERCIAL APPLICTIONS OF SUCH MACHINES. THE MACHINE CONTAINS LARGE NUMBERS OF THE FOLLOWING SEPARATE ELEMENTS: NEURONS, SYNAPSES, AND ROUTING SWITCHES. ARRAYS OF THESE ELEMENTS ARE FABRICATED ON VLSI CHIPS THAT ARE MOUNTED ON PLANER CHIP CARRIERS EACH OF WHICH FORMS A SEPARATE MODULE. THE MODULES ARE CONNECTED DIRECTLY TO NEIGHBORING MODULES ON CIRCUIT BOARDS. NEURON RRAYS ARE ARRANGED IN ROWS AND COLUMNS AND ARE SURROUNDED BY SYNAPTIC AND ROUTING SWITCH ARRAYS. THE SWITCHES SELECT THE CONNECTIONS BETWEEN NEURONS. THE COMPUTER RUNS ENTIRELY IN ANALOG MODE. HOWEVER, CONNECTION ARCHITECTURES, SYNAPTIC GAINS AND TIME CONSTANTS, NEURON PARAMETERS SUCH AS THRESHOLDS AND TRANSFER CHARACTERISTICS ARE SET BY DIGITAL HOST COMPUTER EITHER DIRECTLY FROM THE KEYBOARD OR FROM STORED PROGRAMS. THE HOST COMPUTER ALSO MONITORS THE NETWORK PERFORMANCE BY OBTAINING MULTIPLEXED NEURON OUTPUTS THAT ARE THEN USED IN CONJUNCTION WITH LEARNING ALGORITHMS TO ADJUST NETWORK PERFORMANCE FOR PARTICULAR TASKS.

QUARTEC INC
12321 S 32ND ST
BELLEVUE, NE 68123
Program Manager: WILLIAM M BURCKEL
Contract #:
Title: MODULARLY EXPANDABLE ARTIFICIAL NEURAL NETWORK COMPUTER FOR DEVELOPMENT AND APPLICATION OF LARGE SCALE ANNS
Topic #: N90-001 Office: ONR ID #: 41150

SUCCESSFUL APPLICATION OF ARTIFICIAL NEURAL NETWORKS (ANNs) TO ROBOTIC CONTROL, COMPUTER VISION, ADVANCED SIGNAL PROCESSING AND SPEECH RECOGNITION, REQUIRE TWO ORDERS OF MAGNITUDE INCREASE IN EXECUTION SPEED AND STORAGE SIZE OVER COURRENT ANN SIMULATION EQUIPMENT. IMPORTANT ALSO, IS THE NEED FOR EQUIPMENT THAT IS APPROPRIATE FOR PROLIFERATED APPLICATION OF ANNs TO A DIVERSE FIELD OF COMPUTERS AND ENVIRONMENTS. THE OPPORTUNITY NOW EXISTS TO DESIGN AND BUILD A LARGE SCALE ARTIFICIAL NEURAL NETWORK COMPUTER CAPABLE OF ACHIEVING SPEEDS OF 10(11) INTERCONNECTIONS/SECOND AND A STORAGE CAPACITY OF GIGA-BYTES. THIS COMPUTER WILL BE MODULARLY EXPANDABLE AND OFFER EASY INTEGRATION WITH EXISTING COMPUTER SYSTEMS FOR THE APPLICATIONS OF ARTIFICIAL NEURAL NETWORKS TO A HOST OF REAL WORLD ENVIRONMENTS. UNDER THE PHASE I EFFORT, QUARTEC WILL CONDUCT A PROOF-OF-CONCEPT STUDY LEADING TO THE DEVELOPMENT OF THE MODULARLY EXPANDABLE ARTIFICIAL NEURAL NETWORK (MEANN) COMPUTER. THE MEANN COMPUTER BRINGS TOGETHER SEVERAL STATE-OF-THE-ART TECHNOLOGIES TO MAKE POSSIBLE A POWERFUL ARTIFICIAL NEURAL NETWORK DEVELOPMENT AND

APPLICATION PLATFORM.

MARTINGALE RESEARCH CORP
100 ALLENTOWN PKWY - #211
ALLEN, TX 75002
Program Manager: DR BHARATHI DEVI
Contract #:
Title: AUTOMATIC IMAGE COMPRESSION FEATURE EXTRACTION AND RECOGNITION
Topic #: N90-002 Office: ONR ID #: 41151

WE PROPOSE A STUDY TO EXPLORE THE POSSIBILITY OF DEVELOPING AN IMPROVED TECHNIQUE TO AUTOMATICALLY COMPRESS AN IMAGE AND EXTRACT FEATURES THAT REPRESENT THE IMAGE, OR PARTS OF IT, IN TERMS OF A FEW RELATIONSHIPS CHARACTERIZED BY FRACTALS. WE PLAN TO USE EXISTING TOOLS OF FRACTAL GEOMETRY LIKE HAUSDORFF DIMENSION, ATTRACTORS OBTAINED BY ITERATED FUNCTION SYSTEMS, FRACTAL INTERPOLATION FUNCTIONS TO MODEL AN IMAGE. SPECIFICALLY EDGE DETECTION AND/OR TEXTURE CLASSIFICATION WILL BE CONSIDERED. SIMULATION STUDIES WILL BE CARRIED OUT USING SYNTHETIC IMAGES. FURTHER, WE ASPIRE TO DEVELOP A PATTERN RECOGNITION SYSTEM FOR CLASSIFYING TEXTURES. THIS WILL BE USEFUL FOR THE IDENTIFICATION OF GEOMETRICAL STRUCTURES IN A NATURAL BACKGROUD, WHICH IS OUR PHASE II PROPOSAL.

NETROLOGIC INC
5080 SHOREHAM PL - STE 201
SAN DIEGO, CA 92112
Program Manager: DAN GREENWOOD
Contract #:
Title: *IMPROVED IMAGE COMPRESSION USING FRACTAL CONSTRUCTIONS*
Topic #: N90-002 Office: ONR ID #: 41152

WE PROPOSE TO IMPROVE IMAGE COMPRESSION TECHNIQUES WHICH ARE BASED ON FRACTAL CONSTRUCTIONS. OUR APPROACH BUILDS ON A LINE OF RESEARCH BEGUN HUTCHINSON IN THE EARLY 1980'S. BARNSLEY AND HIS CO-WORKERS LATER APPLIED THESE IDEAS TO THE REPRESENTATION IMAGE DATA. BARNSLEY'S CONSTRUCTIONS ARE MAINLY BASED ON SYSTEMS OF AFFINE TRANSFORMATIONS (AFFINE ITERATED FUNCTION SYSTEMS). THE COORDINATES OF THE AFFINE TRANSFORMATION REPRESENT THE IMAGE DATA. THESE REPRESENTATIONS RESULT, IN THE CASE OF IMAGES DRAWN FROM NATURAL OBJECTS, IN A DATA COMPRESSION OF 10,000 TO 1, WITH GOOD PRESERVATION OF QUALITY IN THE RECONSTITUTED IMAGE. UNFORTUNATELY, CALCULATION OF THE TRANSFORMS IS COMPUTATION INTENSIVE. OUR RESEARCH IS AIMED AT REDUCING THE COMPUTATIONAL REQUIREMENTS, THROUGH A TRADE-OFF WITH COMPRESSION RATIOS. WE PROPOSE TO APPLY TECHNIQUES FROM FUNCTIONAL ANALYSIS AND HARMONIC ANALYSIS ON LIE GROUPS TO SPEED THE COMPUTATION OF AFFINE ITERATED FUNCTION SYSTEMS.

QUADRANT ENGINEERING INC
55 CHERRY LN
AMHERST, MA 01002
Program Manager: JAMES B MEAD
Contract #:
Title: FINE-SCALE MEASUREMENTS OF MICROWAVE BACKSCATTER FROM THE OCEAN SURFACE
Topic #: N90-003 Office: ONR ID #: 41145

WE REQUEST FUNDS TO SUPPORT RESEARCH AIMED AT IMPROVING THE SPATIAL RESOLUTION OF RADARS ON OCEAN TOWERS IN THIS PROPOSAL. SPECIFICALLY, WE PROPOSE TO DEVELOP FOCUSED PHASED-ARRAY CONCEPTS THAT WILL BE APPLICABLE TO FUTURE TOWER EXPERIMENTS. WE SHOW THAT ANTENNA

ARRAYS CAN ACHIEVE FOOTPRINTS AREAS SMALLER THAN 1m2. THE DATA WILL BE COLLECTED AND STORED IN SUCH A MANNER THAT THE FOOTPRINT SIZE AND POSITION ON THE OCEAN SURFACE CAN BE VARIED FOR EACH INSTANT OF TIME. BASIC INFORMATION ON THE TEMPORAL AND SPATIAL DECORRELATION OF SCATTERED MICROWAVE FIELDS CAN THEREFORE BE MEASURED BY SUCH A SYSTEM. IN ADDITION, RADIATION PATTERNS FROM THE PHASED ARRAYS CAN BE FOCUSED TO SPECIFIC LOCATIONS ON THE OCEAN SURFACE AFTER THE SCATTERING MEASUREMENTS HAVE BEEN MADE. THIS WILL ALLOW THE SYSTEM TO "FREEZE" THE OCEAN SURFCE BY PROCESSING DATA OBTAINED SIMULTANEOUSLY FROM EACH ANTENNA ELEMENT OR SIMULATE A SAR PIXEL BY PROCESSING DELAYED RESPONSES FROM THE ANTENNA ELEMENTS.

METRO-LASER
18006 SKYPARK CIR - #108
IRVINE, CA 92714
Program Manager: DR CECIL F HESS
Contract #:
Title: A COMPACT PROGRAMMABLE LASER DOPPLER VELOCIMETER FOR MARINE APPLICATIONS
Topic #: N90-004 Office: ONR ID #: 41146

THIS PROPOSAL DESCRIBES A PROGRAM TO DEVELOP A COMPACT, RUGGED, AND AUTONOMOUS PROGRAMMABLE LASER DOPPLER VELOCIMETER (LDV) FOR MARINE APPLICATIONS. THE SYSTEM WILL INCLUDE TWO MAJOR INNOVATIONS IN LDV TECHNOLOGY: A PROGRAMMABLE DIGITAL SIGNAL PROCESSOR (DSP), AND A PULSED LASER DIODE. THE DSP PROVIDES THE HIGHEST COMPUTATIONAL POWER AND PROGRAMMABILITY IN A COMPACT SIZE ALLOWING THE IMPLEMENTATION OF INTELLIGENT ALGORITHMS WHICH PROCESS LOW SIGNAL LEVELS AND COMPLEX SIGNALS ARISING FROM LIVE MARINE PARTICLES. THE PULSED LASER DIODE OFFERS THE POTENTIAL OF PROVIDING OPTIMUM SIGNAL TO NOISE BY CONCENTRATING ALL OF ITS POWER DURING THE TIMES WHEN THE DIGITIZER IN ON, THUS, IT PROVIDES LARGE BURSTS OF ENERGY DURING THESE SHORT INTERVALS. PULSED LASER DIODES ALSO HAVE THE POTENTIAL OF PROVIDING VERY SIMPLE TWO-VELOCITY COMPONENT SYSTEMS SINCE TWO SETS OF FRINGES CAN BE SEQUENTIALLY PULSED AND THE ELECTRONICS CAN BE SYNCHRONIZED TO TRACK THEM. THE SIZING OF THE PARTICLES WILL ALSO BE ATTEMPED FROM MIE SCATTERED LIGHT. THIS ADDED INFORMATION MAY NOT ALWAYS BE POSSIBLE DUE TO THE PRESENCE OF MULTIPLE PARTICLES AND COMPLEX MARINE SHAPES. THESE CASES WILL BE RECOGNIZED BY THE DSP AND THE INSTRUMENT WILL ONLY PROVIDE THE VELOCITY INFORMATION.

DYNAMICS TECHNOLOGY INC
21311 HAWTHORNE BLVD - STE 300
TORRANCE, CA 90503
Program Manager: RANDALL PATTON
Contract #:
Title: AN EXPENDABLE OCEAN PARTICLE SIZE AND DENSITY SENSOR
Topic #: N90-005 Office: ONR ID #: 41148

DYNAMICS TECHNOLOGY, INC. (DTI) PROPOSES TO DEVELOP AN EXPENDABLE PARTICLE SENSOR (XPS) THAT IS CAPABLE OF ESTIMATING BOTH THE DENSITY AND SIZE DISTRIBUTION OF SUSPENDED PARTICLES IN OCEAN WATER BY MEASURING BOTH THE DISTRIBUTION OF NEAR FORWARD SCATTERED LIGHT AND THE TOTAL BEAM ATTENUATION. THE UNIT EMPLOYS BASIC OPTICS, A LED AND A DETECTOR ARRAY. THE SCATTERED LIGHT IS OPTICALLY TRANSFORMED TO PROVIDE A SPATIAL MAP OF THE ANGULAR SCATTERING INTENSITY DISTRIBUTION. THE DETECTED INTENSITY DISTRIBUTION CAN THEN BE INVERTED TO YIELD INFORMATION ON THE PARTICLE SIZE DENSITY BASED ON BOTH THE DIFFRACTION APPROXIMATION TO MIE SCATTERING APPLIED IN THE NEAR-FORWARD REGION AND EMPIRICAL RELATIONSHIP. THE PROPOSED XPS SYSTEM IS COMPACT, HAS LOW POWER CONSUMPTION, IS LOW COST, AND IS CAPABLE OF CONTINUOUS PROFILING OF THE WATER COLUMN. THE INVERSION TECHNIQUES TO BE APPLIED TO THIS SPECIFIC TYPE OF MEASUREMENT WILL BE ASSESSED THROUGH COMPUTER

SIMULATION AND A PROTOTYPE WILL BE CONSTRUCTED IN PHASE I. THIS ANALYSIS WILL IDENTIFY CRITICAL DESIGN AND INTERPRETATION ISSUES FOR PHASE II DEVELOPMENT.

SEA TECH INC
PO BOX 779
CORVALLIS, OR 97339
Program Manager: J RONALD V ZANEVELD
Contract #:
Title: DEVELOPMENT OF AN EXPENDABLE PARTICLE SENSOR
Topic #: N90-005 Office: ONR ID #: 41147

IN ORDER TO BE ABLE TO RAPIDLY ASSESS THE THREE DIMENSIONAL STRUCTURE OF PARTICULATE MATTER IN THE SEA, WE PROPOSE TO DEVELOP AN EXPENDABLE PARTICLE SENSOR. THE PARTICLE SENSOR WILL HAVE SUFFICIENT RESOLUTION FOR USE IN OLIGOTROPIC WATER. THE DEVICE CAN BE USED REGARDLESS OF AMBIENT LIGHTING CONDITIONS. BOTH FORWARD AND BACK-SCATTERING SENSORS WILL BE EVALUATED. THE FEASIBILITY OF USING MULTIPLE WAVELENGTHS TO MEASURE PARTICLE SIZE DISTRIBUTIONS AND CHLOROPHYLL CONTENT IN ADDITION TO PARTICLE CONCENTRATION WILL BE ASSESSED. PRELIMINARY RESULTS WITH A FORWARD SCATTERING DEVICE SHOW EXCELLENT RESOLUTION (0.5 ug/1). MATHEMATICAL MODELLING OF THE CANDIDATE FORWARD AND BACKSCATTERING DEVICES INDICATE SUFFICIENT POWER OUTPUT FOR MARINE ENVIRONMENTS. THE EXPENDABLE DEVICE REQUIRES NOT ONLY SENSOR DEVELOPMENT BUT ALSO A GREAT DEAL OF ELECTRONICS DEVELOPMENT. WE PROPOSE TO USE SIPPICAN DELIVERY SYSTEMS AND THEY HAVE AGREED TO COOPERATE WITH USE IN THE DEVELOPMENT OF THIS SYSTEM. DURING PHASE I WE PROPOSE TO INTEGRATE THE SENSOR AND ELECTRONICS PACKAGE AND TO TEST AND CALIBRTE IT IN THE LABORATORY AND FIELD.

RADIANT TECHNOLOGIES
1009 BRADBURY SE
ALBUQUERQUE, NM 87106
Program Manager: JEFF A BULLINGTON
Contract #:
Title: PE-MOCVD FERROELECTRIC NONVOLATILE RADIATION-HARD MEMORIES
Topic #: N90-006 Office: ONR ID #: 40819

FERROELECTRIC MATERIALS HAVE BEEN SUCCESSFULLY INTEGRATED WITH BOTH CMOS AND GaAs SEMICONDUCTOR TECHNOLOGIES TO CREATE NONVOLATILE MEMORIES. FERROELECTRIC MATERIALS HAVE ALSO DEMONSTRATED IMMUNITY TO RADIATION DAMAGE AND ARE CURRENTLY BEING DEVELOPED ON TWO SEPARATE GOVERNMENT EFFORTS FOR STRATEGIC LEVEL SYSTEMS. HOWEVER, THE COMPLEX METAL OXIDE CERAMIC BEING USED IN THESE COMMERCIAL AND MILITARY DEVELOPMENT PROGRAMS HAS SEVERAL DISTINCT ISSUES WHICH AFFECT PERFORMANCE. THESE ISSUES INCLUDE PURITY, STRAIN INDUCED CLAMPING, AND HIGH PROCESS TEMPERATURES. THIS PROPOSAL WILL DEVELOP A PLASMA ENHANCED METAL ORGANIC CHEMICAL VAPOR DEPOSITION (PE-MOCVD) PROCESS WHICH WILL ATTACK THE ISSUES LISTED AND RESULT IN HIGHER QUALITY FILMS.

SPIRE CORP
PATRIOTS PK
BEDFORD, MA 01730
Program Manager: DR ANTON C GREENWALD
Contract #:
Title: MOCVD OF LEAD-GERMANATE FOR FERROELECTRIC NON-VOLATILE RAMs
Topic #: N90-006 Office: ONR ID #: 40820

NON-VOLATILE RANDOM ACCESS MEMORIES (NVRAM) OF 256 AND 512 BITS BASED ON THE FERROELECTRIC MATERIAL Pb(Zr, Ti)O3 ARE NOW BEING INTRODUCED INTO THE MARKET. LARGER MEMORIES, OF INTEREST TO THE MILITARY, REQUIRE IMPROVEMENTS IN THE BASIC MATERIAL. THE PROPERTIES OF BULK LEAD-GERMANATE SUGGEST GREAT POTENTIAL FOR THIS APPLICATION, HOWEVER THE PROPERTIES OF THIN FILMS FABRICATED FROM IT TO DATE HAVE NOT BEEN AS GOOD AS THOSE OF OTHER COMPOUNDS. PHASE I OF THE PROPOSED RESEARCH WILL INVESTIGATE CHEMICAL VAPOR DEPOSITON (CVD) AS A MEANS OF DEPOSITING LEAD GERMANATE FILMS OF EXCEPTIONAL PURITY, WITH IMPROVED UNIFORMITY IN COMPOSITION, STRUCTURE, AND THICKNESS. PRELIMINARY MEASUREMENTS OF ELECTRIC PROPERTIES WILL BE MADE. PHASE II OF THE PROPOSED RESEARCH WOULD STUDY MATERIAL INTERACTIONS WITH ELECTRODES AND OPTIMIZE THE ELECTRICAL PROPERTIES OF CVD FILMS.

EIC LABS INC
111 DOWNEY ST
NORWOOD, MA 02062
Program Manager: DR GERHARD L HOLLECK
Contract #:
Title: SACRIFICIAL ELECTRODES
Topic #: N90-007 Office: ONR ID #: 40821

ELECTROMAGNETIC THRUSTERS REPRESENT A PROMISING MEANS FOR THE NOISELESS PROPULSION OF SUBMERSIBLE. THE POWER AND EFFICIENCY OF ELECTROMAGNETIC THRUSTERS IS DETERMINED BY THE CONDUCTIVITY OF THE FLUID AND BY THE STRENGTH OF THE MAGNETIC FIELD. THE LOW CONDUCTIVITY OF SEAWATER IS THE MAIN LIMITATION. WE PROPOSE, THEREFORE, TO ENHANCE THE CONDUCTIVITY OF SEAWATER BY ELECTROCHEMICAL GENERATION OF A STRONG BASE USING ALKALI METAL BASED SACRIFICIAL ELECTRODES. IN PHASE I WE WILL DEMONSTRATE THE FEASIBILITY OF DOUBLING THE CONDUCTIVITY OF FLOWING SEAWATER WITH Li BASED ELECTRODES. ION CONDUCTIVE SURFACE COATINGS WILL BE DEVELOPED FOR SAFE BUT RAPID START UP UPON EXPOSURE TO WATER.

ACCURATE AUTOMATION CORP
1548 RIVERSIDE DR - STE B
CHATTANOOGA, TN 36406
Program Manager: CRAIG HARSTON
Contract #:
Title: NEURAL NETWORKS FOR AUTONOMOUS MOTOR CONTROL
Topic #: N90-008 Office: ONR ID #: 40823

WE PROPOSE TO DEVELOP A ROBOTIC CONTROL SYSTEM WITH NEURAL NETWORK TECHNOLOGY WHICH CAN ADAPT TO VARIABLE PAYLOAD TRANSPORT CONDITIONS. TRADITIONAL TECHNOLOGIES HAVE DIFFICULTY PROVIDING ADAPTIVE AND AUTONOMOUS MOTOR CONTROL OR THE ABILITY TO GENERALIZE TO UNFORESEEN CONDITIONS. ADAPTIVE CONTROL IS NECESSARY BECAUSE THERE IS VARIATION OF COMPONENT MASSES AND INERTIA, DIRECTION OF GRAVITY AND LITTLE ABILITY TO PREPLAN FOR VARIATIONS IN PAYLOADS. IN PHASE I, WE WILL ASSESS THE FEASIBILITY OF SOLVING THESE UNCONTROLLABLE PROBLEMS WITH NEURAL NETWORK TECHNOLOGY. IT APPEARS THAT OUR NEURAL NETWORK CONCEPTS AND PROGRAMS, WHICH HAVE BEEN DEVELOPED OR ARE CURRENTLY IN PROGRESS, ARE APPLICABLE TO ADAPTIVE CONTROL. WE WILL DESIGN AND TEACH THESE ADAPTIVE SYSTEMS TO INTEGRATE DIVERSE INFORMATION, GENERALIZE PRETRAINED RESPONSES, AND SMOOTHLY COORDINATE ANY MULTI-JOINT MOTORIC RESPONSE. IT IS EXPECTED THAT OUR EFFORTS WILL LEAD TO THE DESIGN AND PROTOTYPING OF IMPROVED ROBOTIC SYSTEMS. USING NEUROPHYSIOLOGICAL CONCEPTS TO INFLUENCE THE DESIGN OF NEURAL NETWORK CONTROL SYSTEM STRUCTURES, WILL RESULT IN SMOOTHER, OPTIMALLY OPERATING ROBOT.

NEUROGEN LABS INC
325 HARVARD ST - STE 202
BROOKLINE, MA 02146
Program Manager: DR MICHAEL KUPERSTEIN
Contract #:
Title: NEURAL NETWORKS FOR AUTONOMOUS MOTOR CONTROL
Topic #: N90-008 Office: ONR ID #: 40822

CURRENT METHODS IN MOTOR CONTROL HAVE PROBLEMS DEALING EFFECTIVELY WITH HIGHLY VARIABLE ENVIRONMENTS AND SENSORY-MOTOR PARAMETERS. THE PROPOSED WORK OVERCOMES SOME OF THESE DIFFICULTIES BY BUILDING A NEURAL CONTROLLER THAT LEARNS ADAPTIVE MOTOR CONTROL FROM ITS OWN EXPERIENCE. THE OBJECTIVE OF THE PROPOSED PHASE I STUDY IS TO IMPLEMENT A SINGLE-JOINTED ARM AND CONTROLLER FOR POSITIONING UNFORESEEN PAYLOADS WITH ACCURATE AND STABLE MOVEMENTS. THE PROPOSED IMPLEMENTATION WILL BE BASED ON A WORKING COMPUTER SIMULATION THAT HAS BEEN SHOWN TO ACHIEVE AUTONOMOUS ADAPTIVE CONTROL. THE NEURAL ARM HAS BEEN DESIGNED TO ADAPTIVELY CONTROL ANY NUMBER OF SENSORY INPUTS WITH LINKS OF ANY NUMER OF JOINTS. THE FEEDFORWARD NATURE OF CONTROL WILL ALLOW PARALLEL IMPLEMENTATION IN REAL TIME CROSS MULTIPLE JOINTS. IT WILL TOLERATE INTERNAL NOISE, PARTIAL SYSTEM DAMAGE AND CHANGES IN THE MECHANICAL AND SENSORY PARAMETERS OF THE ROBOT AS THEY OCCUR OVER TIME. THIS ADAPTABILITY ELIMINATES THE NEED FOR OPERATOR CALIBRATION. IN PHASE II OF THIS PROJECT, THIS NEURALL CONTROLLER WILL BE EXTENDED TO MULTIPLE JOINTS.

TECHMOD
10172 GREGORY ST
CYPRESS, CA 90630
Program Manager: DR VLADIMIR KOGAN
Contract #:
Title: METAL-ION SELECTIVE SENSORS
Topic #: N90-009 Office: ONR ID #: 40824

A BIOMIMETIC APPROACH TO THE PROBLEM OF DEVELOPMENT OF METAL-ION SELECTIVE SENSORS IS BASED ON TECHNOLOGY, INCORPORATING AN IONOPHORE OR OTHER ION SELECTIVE SPECIES IN A LANGMUIR-BLODGETT (L-B) MEMBRANE. FOR THE PURPOSE OF DEMONSTRATING FEASIBILITY, THE L-B MEMBRANES CONTAINING VALINOMYCIN WILL BE INVESTIGATED. FOR COMPLEXATION TO OCCUR, THE VALINOMYCIN WILL BE DISPERSED IN SOME TYPE OF MATRIX SUCH AS A FATTY ACID (ARACHIDIC ACID, FATTY ACID DERIVATIVE, SPECIAL POLYMER). USING THIS APPROACH WE EXPECT TO ACHIEVE HIGH LEVEL OF ION SELECTIVITY TRANSFER THROUGH THE MEMBRANES. MODERN TRANSDUCERS TECHNOLOGY WILL BE INCORPORATED. WE WILL USE INTERDIGITATED ELECTRODES TOGETHER WITH CHEMICALLY SENSITIVE DEVICES, SUCH AS MOS, ISFET AND OTHER TRANSDUCERS. ELECTROCHEMICAL CELLS WITH TWO OR THREE ELECTRODES ALSO WILL BE INVESTIGATED. AS A RESULT OF THIS WORK WE EXPECT TO DEFINE AND DESCRIBE THE MECHANISM OF THE TRANSMEMBRANE SELECTIVE ION TRANSPORT AND OF ION-INDEPENDENT ENZYMATIC REACTIONS. THIS STUDY, AS WELL AS EXPERIMENTAL WORK SHOULD CONTRIBUTE TOWARD THE DEVELOPMENT OF WORKING PROTOTYPE OF A PRACTICAL AND COMMERCIALLY PRODUCED METAL-ION SELECTIVE SENSORS.

UNIVERSAL ENERGY SYSTEMS INC
4401 DAYTON-XENIA RD
DAYTON, OH 45432
Program Manager: PETER P PRONKO
Contract #:
Title: FOCUSED ION IMPLANTATION FOR OPTOELECTRONIC CIRCUITS
Topic #: N90-010 Office: ONR ID #: 40825

THE INTENT OF THIS PROGRAM IS TO DEVELOP, TEST, AND EVALUATE THE USE OF FOCUSED ION BEAMS FOR THE PURPOSE OF FABRICATING, THROUGH IN SITU MATERIALS MODIFICATION, THE NECESSARY DIMENSIONAL ELEMENTS FOUND IN OPTOELECTRONIC CIRCUITS. SUCH ELEMENTS WOULD CONSIST OF MONOLITHICALLY INTEGRATED SOLID STATE SOURCE LASERS, OPTICAL SIGNAL HANDLING ELEMENTS SUCH AS BEAM SPLITTERS, COUPLERS, AND WAVEGUIDES, AS WELL AS OPTOELECTRONIC DETECTOR ELEMENTS. FOCUSED ION BEAMS USED DIRECTLY, OR IN THE PRESENCE OF REACTIVE GASES AND IN COMBINATION WITH OTHER PLANAR DEPOSITION TECHNIQUES HAVE THE POTENTIAL FOR SIGNIFICANT ADVANCES IN THE PROCESSING AND FABRICATION TECHNOLOGY OF OPTOELECTRONIC CIRCUITS THROUGH THE PRECISE BEAM WRITING CAPABILITIES THAT IT REPRESENTS.

HNC INC
5501 OBERLIN DR
SAN DIEGO, CA 92121
Program Manager: DR ROBERT HECHT-NIELSEN
Contract #:
Title: NOISE REDUCTION SYSTEM FOR SHIPBOARD SPACES
Topic #: N90-011 Office: ONR ID #: 40826

THIS PROJECT WILL DEVELOP, AND DEMONSTRATE ON A SHIP, A SYSTEM FOR SIGNIFICIANTLY REDUCING NOISE (IN THE 20 Hz - 2,000 Hz RANGE) BY ACTIVE CANCELLATION USING A NEURAL NETWORK TECHNIQUE. THE EMPHASIS WILL BE ON A REAL-WORLD SOLUTION RATHER THAN A LABORATORY DEMONSTRATION. UNLIKE PAST ACTIVE CANCELLATION SYSTEMS, THE SYSTEM PROPOSED HERE WILL NOT INVOLVE THE USE OF UNCOMFORTABLE HEADPHONES. INSTEAD, WE WILL EMPLOY A LIGHTWEIGHT, COOL, CLOTH MESH "ASTRONAUT BEANIE" CONTAINING A SMALL, BATTERY-POWERED ELECTRONIC PACKAGE, AN ARRAY OF SMALL "WALKMAN" TYPE HEADSET SPEAKERS POSITIONED OVER EACH EAR (BUT NOT TOUCHING THE EAR OR CLOSING IT OFF FROM THE OUTSIDE AIR), AND A NOISE CANCELLATION BOOM MICROPHONE. THE ENTIRE UNIT WILL BE RUGGED AND LIGHTWEIGHT AND ABLE TO RUN FOR UP TO 24 HOURS ON TWO STANDARD-SIZE 9-V DISPOSABLE OR RECHARGEABLE 9V LITHIUM BATTERIES (WHICH ARE MOUNTED IN A RUGGED HOLDER AT THE BACK OF THE BEANIE). THE PROJECT WILL ALSO DEVELOP A COMBINATION SQUAWK BOX/MICROPHONE FOR MOUNTING ON THE WALL OF THE SPACE. ALL BRIDGE COMMUNICATIONS AND ALARMS WILL BE PIPED INTO AND OUT OF THIS SPECIAL BOX VIA ORDINARY AUDIO SIGNAL LINES. USING A PROPRIETARY METHOD DESCRIBED IN THE PROPOSAL, THE SAILORS IN THE SPACE WILL BE ABLE TO CLEARLY HEAR ALARMS AND COMMUNICATIONS FROM THE BRIDGE AND BE ABLE TO FREELY AND CONTINUOUSLY SPEAK WITH THE BRIDGE AND WITH EACH OTHER -- ALL WITHOUT PUSHBUTTON OR VOICE ACTIVATED SWITCHES.

OMNI ANALYSIS INC
9663 TIERRA GRANDE - STE #304
SAN DIEGO, CA 92126
Program Manager: CHARLES FARNHAM
Contract #:
Title: TACTICAL DATA QUALITY MEASUREMENT PROGRAM
Topic #: N90-012 Office: ONR ID #: 40827

THIS PROPOSAL DESCRIBES A METHOD FOR ADDRESSING THE DATA OVERLOAD PROBLEM THAT RESULTS FROM MULTIPLE-TARGET, MULTIPLE-SENSOR TRACKING. THE MEASURMENT OF TACTICAL DATA QUALITY IS BASED ON THE PRESENT AND FUTURE TACTICAL STATES, THE DATA THAT MUST BE CONSIDERED, AND THE TYPES OF DECISIONS THAT ARE RELEVANT IN THOSE STATES. THE INITIAL EFFORT (PHASE I) WILL APPLY CONCENTRATED STUDY TO A SELECTED WARFARE AREA, ANTI-AIR WARFARE (AAW). WORK WOULD PROCEED IN THE FOLLOWING MANNER: DETERMINE TYPES OF DATA, IDENTIFY TACTICAL STATES, IDENTIFY AVAILABLE DECISIONS, ANALYZE DATA RELEVANCE IN EACH TACTICAL STATE, AND DEVELOP A TACTICAL DECISION AID (COMPUTER PROGRAM) THAT MONITORS THE TACTICAL STATE AND TACTICAL DECISIONS, AND BASED ON THESE, MEASURES THE VALUE AND PRIORITIZES INCOMING TACTICAL DATA.

TEST THE TACTICAL DECISION AID USING WARGAMING SCENARIOS ON ENWGS. THE PERSONNEL PROPOSED TO CONDUCT THIS PROJECT HAVE EXTENSIVE EXPERIENCE IN NAVAL WARFARE DECISION MAKING IN DATA-SATURATED CONDITIONS, AND THEY ARE FAMILIAR WITH COMPUTER-BASED COMBAT DIRECTION SYSTEMS (OPERATIONAL/DEVELOPMENTAL).

MICROWAVE DEVICE TECHNOLOGY CORP
1 POWERS ST
LAWRENCE, MA 01843
Program Manager: DR T B RAMACHANDRAN
Contract #:
Title: EFFICIENCY ENHANCEMENT OF IMPATT DIODES
Topic #: N90-013 Office: ONR ID #: 40829

A NEW APPROACH FOR IMPROVING THE EFFICIENCY OF AN IMPATT DIODE HAS BEEN PROPOSED BY THE USE OF HETEROSTRUCTURES. THE GOAL FOR THE CONVERSION EFFICIENCY IS A MINIMUM OF 32%. THE HETEROSTRUCTURE WILL CONSIST OF A LOW BAND GAP MATERIAL (E.G. GaInAs) FOR THE AVALANCHE REGION AND A HIGHER BAND GAP MATERIAL (E.G. InP) FOR THE DRIFT REGION. A THEORETICAL ANALYSIS INCLUDING COMPUTER SIMULATION WILL BE PERFORMED FOR SELECTING THE PROMISING MATERIALS FOR THE FABRICATION OF IMPATTs. THE THEORETICAL STUDY WILL INCLUDE NOT ONLY THE DC CHARACTERISTICS (E.G. BREAKDOWN VOLTAGE, LEAKAGE ETC.) BUT RF PROPERTIES AS WELL. SOME OF THE SELECTED MATERIALS WILL BE GROWN EITHER BY MBE OR BY MOCVD. FOLLOWING CHARACTERIZATION, THE WAFER(S) WILL BE PROCESSED INTO CHIPS. AN ATTEMPT WILL BE MADE TO OBTAIN PULSED RF RESULTS BEFORE THE END OF PHASE I.

ANALOG CIRCUIT DESIGN
1313 FIFTH ST SE
MINNEAPOLIS, MN 55414
Program Manager: ERIC PERSSON
Contract #:
Title: PLANAR MAGNETIC COMPONENTS FOR EFFICIENT POWER CONVERSION BEYOND 1 MHz
Topic #: N90-014 Office: ONR ID #: 40830

THE OBJECT OF THE PROPOSED PROGRAM IS TO DEMONSTRATE FEASIBILITY OF DESIGNING HIGH EFFICIENCY TRANSFORMERS OF LOW MECHANICAL PROFILE FOR HIGH FREQUENCY POWER CONVERSION APPLICATIONS. THE PROGRAM WILL BE DIRECTED TOWARD GAINING INSIGHT INTO THE DOMINANT LOSS MECHANISMS OF THE WINDING AND CORE STRUCTURES AT HIGH FREQUENCIES. NEW APPROACHES FOR TRANSFORMER CONSTRUCTION, SUCH AS THE USE OF LAMINATED FERRITE MATERIALS WILL BE INVESTIGATED, AS WELL AS USING AIR CORE CONSTRUCTION IN ORDER TO REDUCE CORE LOSSES. A FAMILY OF PARAMETRIC PERFORMANCE CHARACTERISTICS WILL BE DEVELOPED TO GUIDE THE OPTIMIZATION PROCESS. WINDINGS WILL BE FABRICATED USING ADVANCED PHOTOLITHOGRAPHY, ETCHING AND PLATING PROCESSES. HIGH SPEED AUTOMATIC DICING SAWS WILL BE USED TO FABRICATE MAGNETIC CORES.

CORDEC CORP
PO BOX 188 - 8270-B CINDER BED RD
LORTON, VA 22079
Program Manager: DR RAYMOND J WEIMER
Contract #:
Title: FUNCTIONALLY GRADIENT ELECTRONIC HEAT SINK MATERIALS
Topic #: N90-015 Office: ONR ID #: 40831

RELIABILITY AND CIRCUIT DENSITY OF STANDARD ELECTRONIC MODULES (SEM) CAN BE INCREASED

SIGNIFICANTLY BY TAILORING THERMOPHYSICAL PROPERTIES OF THE HEAT SINK MATERIALS. NEWLY DEVELOPED TECHNIQUES FOR MANUFACTURING METAL MATRIX COMPOSITES (MMC) BY VAPOR DEPOSITION METHODS WILL BE USED TO DEMONSTRATE LIGHT-WEIGHT, HIGH-PERFORMANCE HEAT SINKS HAVING THERAML CONDUCTIVITIES IN EXCESS OF 300 W/m-K AS WELL AS COEFFICIENTS OF THERMAL EXPANSION (CTE) OF 6-7 ppm PER DEGREE CELSIUS.

RESEARCH OPPORTUNITIES INC
2200 AMAPOLA CT - STE 101
TORRANCE, CA 90501
Program Manager: WILLIAM C RILEY
Contract #:
Title: ADVANCED MATERIALS FOR ELECTRONIC PACKAGING APPLICATIONS
Topic #: N90-015 Office: ONR ID #: 40832

AS POWER REQUIREMENTS FOR ELECTRONIC DEVICES INCREASE, THE THERMAL EXPANSION MATCH BETWEEN THE VARIOUS COMPONENTS BECOMES AN IMPORTANT FACTOR IN DETERMINING RELIABILITY. FOR SEM E THIS INCLUDES THE Si CHIP, CASE, PRINTED WIRING BOARD (PWB), AND FRAME. THE INNOVATION IN THIS PROPOSAL IS TO MATCH THE THERMAL EXPANSION OF ALL FOUR OF THESE COMPONENTS USING ADVANCED MATERIALS, PARTICULARLY COMPOSITES. HIGH THERMAL CONDUCTIVITY MATERIALS WILL BE EMPHASIZED WHILE RECOGNIZING THE REQUIREMENT FOR DIELELECTRIC PROPERTIES IN SOME COMPONENTS. FOR THE CASE, AlN MATCHES Si IN THERMAL EXPANSION AND ALSO HAS BOTH EXCELLENT DIELECTRIC PROPERTIES AND HIGH THERMAL CONDUCTIVITY. ASSUMING A GLASS-EPOXY DIELECTRIC, THE PWB THERMAL EXPANSION MUST BE MATCHED TO CHIP AND CASE BY CONSTRAINING LAYERS. THE USE OF HIGH THERMAL CONDUCTIVITY GRAPHITE FIBERS WITH NEGATIVE THERMAL EXPANSION IN THESE LAYERS IS INDICATED. IN THE THERMAL PLANE, GRAPHITE FIBERS CAN BE USED IN Cu OR Al MATRICES TO MATCH PWB THERMAL EXPANSION. IN PHASE I, MATERIALS WILL BE SELECTED FOR DEMONSTRATION BASED ON THE STATUS OF FABRICATION TECHNOLOGY AND POTENTIAL IMPACT ON DEVICE PERFORMANCE, RELIABILITY, AND COST. MEASUREMENT OF THERMAL CONDUCTIVITY AND THERMAL EXPANSION OF THE MATERIALS SELECTED WILL CONFIRM PREDICTED PROPERTIES. IN PHASE II THE VARIOUS DEVICE COMPONENTS WILL BE ASSEMBLED FOR QUALIFICATION TESTING.

PHYSICAL OPTICS CORP
2545 W 237TH ST - STE B
TORRANCE, CA 90505
Program Manager: DR TOMASZ JANNSON
Contract #:
Title: HOLOGRAPHIC NEURO-OPTIC PROCESSOR FOR PATTERN RECOGNITION
Topic #: N90-016 Office: ONR ID #: 40833

PHYSICAL OPTICS CORPORATION (POC) PROPOSES A NOVEL NEURO-OPTIC SYSTEM FOR PATTERN RECOGNITION WHICH USES MASSIVELY PARALLEL PROCESSING CAPABILITY, BASED ON HOLOGRAPHIC TECHNIQUES. THE RESULTING HOLOGRAPHIC NEURO-OPTIC PROCESSOR (HNOP) WILL BE CAPABLE OF PERFORMING HIGHLY PARALLEL OPERATIONS DUE TO A SPECIALLY RECORDED HOLOGRAPHIC INTERCONNECTIVITY MATRIX WORKING IN CONJUNCTION WITH A 2D SPATIAL LIGHT MODULATOR. THE ADVANTAGE OF OUR SYSTEM IS THAT OUTSTANDING INFORMATION CAPACITY CAN BE ACHIEVED IN ADDITION TO FULL PROCESSING PARALLELITY OF THE RECOGNITION PROCESS. THE INTER- CONNECTIVITY OF OUR PROCESSOR CAN BE AS HIGH AS 10(12) WHICH IS 10(4) TIMES BETTER THAN THAT OF HUMAN CORTICAL HYPERCOLUMN. VARIOUS ARCHITECTURES OF POC's HNOPs ARE ABLE TO PERFORM ASSOCIATIVE MEMORY, FEATURE EXTRACTION, NOVELTY FILTERING IN ADDITION TO AUTOMATIC PATTERN RECOGNITION.

ATLANTIC APPLIED RESEARCH CORP

4 - "A" ST
BURLINGTON, MA 01803
Program Manager: MICHAEL J RUDD
Contract #:
Title: LOW COST UNDERWATER ACOUSTIC SENSORS
Topic #: N90-017 Office: ONR ID #: 40834

THE DEVELOPMENT OF LOW-COST, DEPTH INSENSITIVE, CLOSELY MATCHED ACOUSTIC SENSORS WILL BE INITIATED. THE MOST LIKELY TECHNOLOGY FOR THESE SENSORS IS OIL-BACK THIN FILM POLY-VINYLIDENE FLOURIDE PLASTIC. THESE CAN GIVE A PERFORMANCE EQUIVALENT TO CURRENT CERAMIC TECHNOLOGY, BUT AT AN ORDER OF MAGNITUDE LESS COST. PHASE I WILL DESIGN FABRICATE AND TEST A PROTOTYPE SENSOR.

PAI CORP
116 MILAN WY
OAK RIDGE, TN 37830
Program Manager: DR HERBERT W HOFFMAN
Contract #:
Title: AUTOMATED LITHIUM LIQUID METAL HANDLING STATION
Topic #: N90-018 Office: ONR ID #: 40835

THIS PROJECT WILL CONCEIVE AND DEVELOP AN AUTOMATED SYSTEM FOR FILLING EXPERIMENTAL OR PRODUCTION CONTAINERS WITH LITHIUM AND WILL SPECIFY AN OPTIMUM HANDLING PROTOCOL THAT WILL IMPROVE OR MAINTAIN LITHIUM PURITY. IT IS DESIRED THAT THE SYSTEM BE SIMPLE IN CONCEPT, SAFE AND CONVENIENT IN OPERATION, AND OF RELATIVELY LOW COST. THE DESIGN OF THE SYSTEM WILL BE BASED ON LIQUID METAL HANDLING TECHNIQUES DEVELOPED DURING THE MANY YEARS IN WHICH LITHIUM HAS BEEN A MATERIAL OF INTEREST AS A SPACE NUCLEAR POWER PLANT REACTION COOLANT. PARTICULAR ADVANTAGE WILL BE TAKEN OF TECHNIQUES, EQUIPMENT, AND INSTRUMENTATION THAT HAS BEEN USED AT THE OAK RIDGE NATIONAL LABORATORY DURING ITS MANY YEARS OF DEVELOPING EXPERIMENTAL POWER SYSTEMS USING LIQUID METALS, INCLUDING LITHIUM. PHASE I WILL DRAW TOGETHER THE LATEST PERTINENT INFORMATION ON LITHIUM HANDLING (PURIFICATION AND FILL) SYSTEMS, ESTABLISH SPECIFIC DESIGN REQUIREMENTS FOR THE U.S. NAVY APPLICATION, ESTABLISH COMPONENTS AND SYSTEMS DATA, AND PRODUCE A CONCEPTUAL DESIGN THAT WILL SATISFY NAVY REQUIREMENTS.

ADVANCED TECHNOLOGY MATERIALS INC (ATM)
520-B DANBURY RD
NEW MILFORD, CT 06776
Program Manager: EDWARD A STURM
Contract #:
Title: NOVEL PROCESSING OF COATED BORON PARTICLES
Topic #: N90-020 Office: ONR ID #: 40837

SOLID METAL FUELS CAN PROVIDE GREATER THRUST AND FUEL EFFICIENCY THAN LIQUID FUELS. BORON PARTICLES, A MOST ATTRACTIVE SOLID FUEL ON A THERMOCHEMICAL BASIS, IGNITE UPON EXPOSURE TO MOIST AIR AND UNDERGO A RAPID COMBUSTION WITH HIGH VOLUMETRIC HEAT RELEASE. UNFORTUNATELY, THIS REACTION IS SIGNIFICANTLY SLOWED BY IMPURITIES IN THE BORON AND BY THE FORMATION OF OXIDES UPON THE PARTICLE SURFACE DURING THE IGNITION PROCESS. HOWEVER, IT SHOULD BE POSSIBLE TO DEPOSIT A CONTINUOUS THIN FILM OF ALUMINUM OR MAGNESIUM ONTO PURE BORON VIA CVD, ALLOWING UNIFORM PARTICLE HEATING AND IGNITION WITHOUT SURFACE PASSIVATION. A NOVEL ALUMINUM SOURCE REAGENT AND COATING PROCESS HAVE ALREADY BEEN DEVELOPED BY ATM. IN PHASE I, AN INNOVATIVE COATING TECHNIQUE WILL BE EMPLOYED ALLOWING UTILIZATION OF THIS TECHNOLOGY AND OPTIMIZATION OF THE METAL COATINGS. A SIMILAR PROCESS WILL BE

DEVELOPED FOR MGNESIUM COATING OF THE SOLID FUEL AND REACTION KINETICS WILL BE EVALUATED TO ASSESS COATING EFFECTIVENESS. POSITIVE PHASE I RESULTS, INCLUDING COST ESTIMATES, WILL RESULT IN A PHASE II PROGRAM IN WHICH BORON PURITY IS ASSURED VIA IN-SITU COATING OF VAPOR DEPOSITED BORON PARTICLES. REACTION KINETICS WILL BE OPTIMIZED THROUGH COATING APPLICATION AND PILOT QUANTITIES OF METAL COATED BORON PARTICLES WILL BE PRODUCED FOR COMBUSTION TESTING.

AERO-CHEM RESEARCH LABS INC
PO BOX 12
PRINCETON, NJ 08542
Program Manager: DR WILLIAM FELDER
Contract #:
Title: REACTIVITY OF COATED BORON PARTICLES IN COMBUSTION ENVIRONMENTS
Topic #: N90-020 Office: ONR ID #: 40836

A MEASUREMENT METHOD AND APPARATUS ARE PROPOSED TO DETERMINE THE REACTIVITIES OF A NEW GENERATION OF BORON PARTICLE FUELS. THE NEW FUEL PARTICLES WILL BE SMALL (LESS THAN 5 um DIAM) AND COATED WITH REACTIVE METALS TO AID IN THEIR IGNITION. THE FUEL PARTICLES WILL BE SUPPLIED FROM TWO ONGOING PROGRAMS AT AERO-CHEM AS WELL AS FROM OTHERS WORKING IN THIS AREA. THE MEASUREMENT METHOD AND APPARATUS ARE BASED ON THE INJECTION AND VIDEO OBSERVATION OF SINGLE PARTICLES INTO A FLAT FLAME OF KNOWN TEMPERATURE AND COMPOSITION. WORK DONE WITH A SIMILAR METHOD IN THE SIXTIES ON THE IGNITION AND COMBUSTION OF SEVERAL, LARGER DIAMETER (15-80 um) METAL FUEL PARTICLES PROVIDED DATA WHICH IS STILL USED TODAY IN EVALUATING MODEL PREDICTIONS. THE PROPOSED WORK AIMS AT PROVIDING SIMILAR DATA FOR SMALLER, PURER, COATED (AND UNCOATED) BORON PARTICLES. THE REACTIVITIES OF THE COATED PARTICLES WITH WATER VAPOR WILL BE DETERMINED FROM MEASUREMENTS OF IGNITION TIME, IGNITION TEMPERATURE, AND BURNUP TIME IN A SERIES OF ATMOSPHERIC PRESSURE FLAT FLAMES HAVING A RANGE OF TEMPERATURES AND COMPOSITIONS. THE DEVELOPMENT OF THIS REACTIVITY MEASUREMENT AT AERO-CHEM WILL PROVIDE AN INTEGRATED PROGRAM OF PREPARATION AND EVALUATION OF THE NEW GENERATION OF BORON PARTICLE FUELS. THE MAJOR RESEARCH ISSUES TO BE INVESTIGATED INVOLVE POTENTIAL CONDENSED PHASE REACTIONS BETWEEN THE COATING MATERIAL AND THE BORON PARTICLE AND THE DETERMINATION OF THE EFFECTS OF SUCH REACTIONS ON THE PARTICLE REACTIVITY.

IKONIX INC
2302 HORSE PEN RD
HERNDON, VA 22070
Program Manager: ROBERT L STITES
Contract #:
Title: A NEURAL NETWORK SOLUTION TO THE REAL-TIME OPTIMAL ALLOCATION OF MARINE CORPS TACTICAL AND C3I ASSETS
Topic #: N90-021 Office: MCRDAC ID #: 40838

THE EFFICIENCY WITH WHICH ASSETS ARE ALLOCATED DURING COMBAT HAS USUALLY PLAYED A DOMINANT ROLE IN THE OUTCOME OF THE CONFLICT – OFTEN ECLIPSING ALL OTHER FACTORS, INCLUDING VARIANCES IN FORCE STRUCTURE. THE SOLUTION OF OPTIMAL ALLOCATION PROBLEMS IS NO LESS CRITICAL TO THE DESIGN AND OPERATION OF C3I NETWORKS. THUS, THE ABILITY TO PERFORM THIS ENABLING TASK AS EFFICIENTLY AS POSSIBLE IS VITAL. WE PROPOSE TO DEMONSTRATE THE FEASIBILITY OF USING A HYBRID ARTIFICIAL NEURAL NETWORK (ANN) ARCHITECTURE TO INTEGRATE TACTICAL INFORMATION SUCH AS FRIENDLY AND ENEMY FORCE STRENGTH AND DISPOSITIONS, AND THEN USE THAT INFORMATION TO CALCULATE THE OPTICAL ALLOCATIONS OF THE COMMAND'S COMBAT ASSETS SUBJECT TO A GIVEN SET OF CONSTRAINTS. OUR METHODOLOGY HAS BEEN SUCCESSFULLY DEMONSTRATED ON A VARIETY OF TACTICAL ALLOCATION PROBLEMS, INCLUDING COMMUNICATION RELAY SITE LAYOUT AND

TERRAIN-SENSITIVE MOVEMENT PLANNING. THIS METHODOLOGY USES OUR PROPRIETARY COMBINATIONAL OPTIMIZATION ALGORITHMS. THE HEURISTICS EMPLOYED IN OUR NETWORK GENERATION ROUTINES RENDER THE RESULTING ANN MORE ROBUST WITH RESPECT TO LOCAL MINIMA AND INITIAL CONDITION SPECIFICATION THAN ANY OTHER DESIGN THAT HAS BEEN REPORTED. FURTHER, FOR LARGE SCALE PROBLEMS, OUR ALGORITHM IS MORE COMPUTATIONALLY EFFICIENT THAN TRADITIONAL ALTERNATIVES, EVEN ON SERIAL DIGITAL PROCESSORS.

MI-TECH INC
600 MARYLAND AVE SE - STE 695
WASHINGTON, DC 20024
Program Manager: ROGER K DIEHL
Contract #:
Title: JOINT OPERATIONS INTEROPERABILITY SYSTEM FOR MARINE CORPS C3I SYSTEM
Topic #: N90-022 Office: MCRDAC ID #: 40840

THE OBJECTIVE OF THIS PROJECT IS TO CONDUCT AND DOCUMENT AN ANALYSIS, BASED ON THE MARINE TACTICAL SYSTEMS (MTS) PROTOCOL, TO DETERMINE THE FEASIBILITY OF DEVELOPING A DATA LINK INTERFACE SYSTEM (DLIS) THAT COULD INTERFACE MULTIPLE NON-MTS DIGITAL DATA LINK PROTOCOLS TO THE MTS PROTOCOL, AND BE READILY ADAPTED TO CHANGING INTERFACE REQUIREMENTS. IN ADDITION TO THE DOCUMENTED FEASIBILITY ANALYSIS, THIS EFFORT WILL INCLUDE THE DEVELOPMENT OF A DEMONSTRATION DLIS TO PROVE THE FEASIBILITY OF THE PHASE II SYSTEM DEVELOPMENT. BASED ON THE CAPABILITY TO PROVIDE AN INFORMATION TRANSFORMATION CAPABILITY, THIS ANALYSIS WILL FOCUS ON EACH LAYER OF THE ISO/OSI PROTOCOL MODEL ALONG WITH A ZERO TRANS- MISSION LAYER AS DEFINED INTHE MTS TECHNICAL INTERFACE DESIGN PLAN (TIDP). EACH LAYER WILL BE ANALYZED TO DETERMINE THE PROCESSING AND INFORMATION TRANSFORMATION REQUIREMENTS TO SUPPORT THE DLIS CONCEPT. THE FEASIBILITY ANALYSIS WILL ADDRESS THE CAPABILITY OF CURRENT TECHNOLOGY TO PROVIDE A HIGHLY MODULAR, READILY ADAPTABLE SOLUTION TO TODAY'S INTER/INTRA-OPERABILITY INTEGRATION PROBLEM.

MIKROS SYSTEMS CORP
3490 U.S. RTE 1 - BLDG 15
PRINCETON, NJ 08540
Program Manager: DR JOSEPH R BURNS
Contract #:
Title: MULTIPLE TADIL PROCESSING
Topic #: N90-022 Office: MCRDAC ID #: 40839

THE PROBLEM IDENTIFIED IN THIS PROJECT IS THE LACK OF COMMUNICATION INTEROPERABILITY. THE PROBLEM WAS DISCOVERED DURING THE VIETNAM CONFLICT AND CORRECTIVE ACTION BEGAN WITH THE TACS/TADS INTERFACE PROGRAM. THE RECOMMENDED APPROACH IS ONE WHICH ADDS ANOTHER "TRANSLATOR BOX/CARD" IN A COMMUNICATION SYSTEM ALREADY LADENED WITH COSTLY BLACK BOXES. THE FOLLOWING THESIS IS ONE WHICH ATTACKS THE ROOT PROBLEM VICE PATCHING A SYMPTON. THIS PAPER PROPOSES A SHIFT FROM ELECTRONIC CIRCUITRY (RESISTOR/CAPACITOR) TO DIGITAL SIGNAL PROCESSING (DSP) FOR MODULATION/DEMODULATION OF THE SIGNAL. MULTIPLE WAVEFORMS COULD BE PROCESSED BY A SINGLE DSP COMPUTER WHICH COULD THEN INTERFACE A SINGLE DATA STREAM TO THE MARINE CORPS TACTICAL SYSTEM (MTS). THE COMPUTER WOULD BE BASED ON A HIGH PERFORMANCE MIL-STD-1750A MICROPROCESSOR USING A STANDARD VME BACKPLANE AND ENCLOSED IN A GOVERNMENT STANDARD DESK/TOP COMPUTER (DTC-2) OR SIMILAR VME CARD CAGE.

EOS TECHNOLOGIES INC
606 WILSHIRE BLVD - STE 700
SANTA MONICA, CA 90401

Program Manager: BLAIR B DILLAWAY
Contract #:
Title: MULTILEVEL SECURITY SYSTEMS FOR AMPHIBIOUS OPERATION COMMAND AND CONTROL
Topic #: N90-023 Office: MCRDAC ID #: 40842

THE MODERN BATTLEFIELD DEMANDS RAPID INFORMATION ACCESS TO SUPPORT THE EFFECTIVE APPLICATION OF TACTICAL FORCES. A KEY ELEMENT IN THIS PROCESS IS THE COLLECTION, ANALYSIS, AND DISSEMINATION OF INTELLIGENCE. TO MEET THESE NEEDS, THERE IS INCREASING USE OF AUTOMATION SYSTEMS IN SUPPORT OF THE INTELLIGENCE STAFF. THE TRADITIONAL APPROACH, RELYING ON SYSTEM ISOLATION, TO INSURE PROTECTION OF HIGHLY SENSITIVE INFORMATION, HAS FAILED TO MEET OPERATIONAL NEEDS. THE USMC HAS AN URGENT REQUIREMENT TO ADDRESS THIS DEFICIENCY. AMPHIBIOUS OPERATIONS DEMAND A HIGHLY RESPONSIVE INTELLIGENCE SYSTEM. AT THE SAME TIME, THE VARIETY OF SENSITIVE DATA SOURCES EMPLOYED PLACES A PREMIUM ON PROTECTION FROM INFORMATION COMPROMISE. TO ADDRESS THESE NEEDS, SPECIFICATION OF A BASELINE, SYSTEM LEVEL, APPROACH TO PROVIDING A MULTILEVEL SECURE INTELLIGENCE AUTOMATION CAPABILITY FOR THE MTACCS IS PROPOSED. THIS SYSTEM WILL TAKE ADVANTAGE OF RECENT ADVANCES IN INFORMATION SECURITY TECHNOLOGY AND AVAILABLE COMMERCIAL COMPONENTS.

SAVANNAH RIVER ASSOCS INC
201 S MAIN ST
DUMFRIES, VA 22026
Program Manager: ELDON R LANDERS
Contract #:
Title: MULTI-LEVEL SECURITY SYSTEM FOR AMPHIBIOUS OPERATION COMMAND AND CONTROL
Topic #: N90-023 Office: MCRDAC ID #: 40841

SOFTWARE DEVELOPED TO FACILITATE A MULTI-LEVEL SECURITY SYSTEM MUST MEET A VARIETY OF SECURITY AND PERFORMANCE SPECIFICATIONS IN AN OPERATIONAL ENVIRONMENT. WE PROPOSE TO ANALYZE, DESIGN AND DEVELOP A SECURITY SYSTEM FOR THE MARINE CORPS COMMAND AND CONTROL SYSTEM BY EMPLOYING STATE-OF-THE-ART SYSTEM ENGINEERING METHODOLOGIES, TECHNIQUES AND PRINCIPLES. SRA WILL EMPLOY A SYSTEM LIFE CYCLE APPROACH TO: CONDUCT A SYSTEMATIC STUDY OF THE MARINE CORPS IMMEDIATE AND LONG-TERM SYSTEM SECURITY REQUIREMENTS; IDENTIFY ANY EXISTING SYSTEM SECURITY PRODUCTS FOR NEAR TERM APPLICATION; DETERMINE WHAT PRODUCTS AND INTEGRATION PROCESS ARE REQUIRED TO SATISFY CURRENT SECURITY REQUIREMENTS; DEVELOP A PROTOTYPE SYSTEM IMPLEMENTATION PLAN (PAPER PROOF-OF-CONCEPT); AND IDENTIFY CONTINGENCY PLANS FOR REQUIREMENT SATISFACTION IN THE EVENT THAT SECURITY SOFTWARE OR THE HARDWARE FOR PHASE II IS NOT READILY AVAILABLE FOR INTEGRATION INTO THE PROTOTYPE SYSTEM. THIS APPROACH WILL PROVIDE THE MARINE CORPS WITH THE OPTIMAL APPROACH FOR THE SOLUTION OF WHAT IS A LONG-TERM REQUIREMENT FOR MULTI-LEVEL SECURITY.

HIGH PERFORMANCE MARINE PRODUCTS
4811 TRAILWOOD WY
SPRINGFIELD, MO 65809
Program Manager: WALDO E RODLER
Contract #:
Title: INTEGRAL ELECTRIC MOTOR/WATERJETS FOR HIGH SPEED AMPHIBIANS
Topic #: N90-024 Office: MCRDAC ID #: 40845

THIS PROPOSAL RECOMMENDS A DESIGN STUDY AND EVALUATION OF AN INTEGRAL ELECTRIC MOTOR/WATERJET BASED ON A UNIQUE WATERJET CONFIGURATION THAT HAS DEMONSTRATED IMPROVED PERFORMANCE COMPARED TO CONVENTIONAL WATERJET ARRANGEMENTS IN THE PLEASURE BOAT SIZE. IT IS LIKELY THAT A SIMILAR IMPROVEMENT WILL BE FOUND WITH LARGER UNITS SUITABLE FOR MILITARY APPLICATIONS LIKE THE AAAV. ACCESS FOR MOTOR MAINTENANCE AND REPLACEMENT IS

MUCH EASIER THAN WITH CONVENTIONAL CONFIGURATIONS. MOTORS DIAMETER CAN BE LARGER THAN CONVENTIONAL CONFIGURATIONS WHICH PERMITS USE OF A SHORTER MOTOR. THE LARGER DIAMETER, SHORTER MOTOR CAN DELIVER THE REQUIRED POWER AT HIGHER TORQUE AND LOWER SPEED WHICH SIMPLIFIES THE REQUIRED GEAR TRAIN TO DRIVE THE IMPELLER AND REDUCE GEAR NOISE AND RESULTING NOISE SIGNATURE.

OCEAN SYSTEMS RESEARCH INC
580 BELLERIVE DR - STE 5C
ANNAPOLIS, MD 21401
Program Manager: JAMES W WHITE
Contract #:
Title: SUBMERSIBLE MOTOR AMPHIBIOUS THRUSTER
Topic #: N90-024 Office: MCRDAC ID #: 40844

SUBMERSIBLE MOTOR THRUSTER SYSTEM IS PROPOSED WHICH OFFERS IMPROVED PERFORMANCE AND EFFICIENCY OF MARINE CORP AMPHIBIOUS VEHICLES. THE SYSTEM IS LESS COMPLEX THAN ALTERNATIVES AND CAN BE EASILY MOUNTED ON A HINGED TRANSOM. THE SYSTEM CONSISTS OF SQUIRREL CAGE INDUCTION MOTORS MOUNTED ON THE OUTSIDE OF THE TIPS OF WATERJET PROPELLER BLADES. THE MOTORS AND PROPELLERS ARE SUPPORTED BY BEARINGS ON THE OUTSIDE DIAMETER SO THERE IS NO CENTER SHAFT. INDIVIDUAL PROPELLER/MOTOR SETS CAN BE MOUNTED TOGETHER TO FORM A CONTRA- ROTATING SYSTEM WITHOUT COMPLEX SHAFTS, BEARINGS, AND SEALS. PHASE I OF THE EFFORT WILL BE FOR THE PRELIMINARY DESIGN OF A PROPULSOR SYSTEM SUITABLE FOR INSTALLATION IN A SELECTED AMPHIBIOUS VEHICLE. ALL THE NECESSARY MANUFACTURING CAPABILITIES WILL BE IDENTIFIED DURING PHASE I SO THEY CAN BE USED IN PHASE II FOR DETAILED DESIGNS AND FOR THE MANUFACTURE OF MODEL HARDWARE FOR TESTING.

UNIQUE MOBILITY INC
3700 S JASON ST
ENGLEWOOD, CO 80110
Program Manager: WILLIAM M ANDERSON
Contract #:
Title: INTEGRAL ELECTRIC MOTOR/WATERJETS FOR HIGH SPEED AMPHIBIANS
Topic #: N90-024 Office: MCRDAC ID #: 40843

UNIQUE MOBILITY HAS INVENTED A NOVEL MEANS OF CONSTRUCTING A BRUSHLESS DC MOTOR WHICH OPERATES WITH HIGH EFFICIENCY AND HIGH POWER CAPABILITY. FOR SURFACE CRAFT, SUCH AS THE AAAV, THIS MOTOR IS PROPOSED TO BE PACKAGED INTEGRAL WITH A WATERJET PROPULSOR TO EFFECT A LIGHTWEIGHT ELECTRIC MOTOR/WATERJET ASSEMBLY CAPABLE OF PRODUCING 4000 POUNDS OF THRUST. THIS CONCEPT, IF PROVEN FEASIBLE IN THE PROPOSED PHASE I STUDY, OFFERS AN OPPORTUNITY FOR IMPROVED PACKAGING FLEXIBILITY AND ENHANCED VEHICLE PERFORMANCE.

UNIQUE MOBILITY INC
3700 S JASON ST
ENGLEWOOD, CO 80110
Program Manager: WILLIAM M ANDERSON
Contract #:
Title: INTERCHANGABLE MOTOR AND ALTERNATOR ELECTRICAL ROTATING GROUPS FOR HIGH SPEED ADVANCED ASSAULT AMPHIBIOUS VEHICLES (AAAV)
Topic #: N90-025 Office: MCRDAC ID #: 40846

UNIQUE MOBILITY HAS INVENTED A NOVEL MEANS OF CONSTRUCTING A BRUSHLESS DC MOTOR WHICH

OPERATES WITH HIGH EFFICIENCY AND HIGH POWER CAPABILITY. THE ASSOCIATED UNIQUE PERMANENT MAGNET MOTOR TECHNOLOGY MAY BE AN IDEAL CANDIDATE FOR THE AAAV APPLICATION OF A COMMON MOTOR/ALTERNATOR. IN THE PHASE I CONCEPT STUDY, A SINGLE ROTATING DEVICE IS PROPOSED TO SERVE AS A TRANSOM MOUNTED WATERJET MOTOR AS WELL AS A MATCHING ENGINE DRIVEN ALTERNATOR POWER SOURCE. THE FEASIBILITY OF USING THIS SAME ROTATING DEVICE AS A LAND TRACTION MOTOR WILL ALSO BE EXPLORED. IF PROVEN FEASIBLE, THE COMMON MOTOR/ALTERNATOR WILL OFFER REDUCED DEVELOPMENT TIME FOR THE AAAV PROPULSION SYSTEM.

DAVIS TECHNOLOGIES INTERNATIONAL INC
5025 ARAPAHO RD - STE 505
DALLAS, TX 75248
Program Manager: LEO W DAVIS
Contract #:
Title: COMPRESSIBLE FLUID STRUT FOR WHEELED VEHICLES
Topic #: N90-026 Office: MCRDAC ID #: 40848

THE DEVELOPMENT OF A LINEAR STRUT SUSPENSION SYSTEM DESIGN UTILIZING COMPRESSIBLE FLUID IS PROPOSED TO ENHANCE THE UTILITY OF THE USMC LAV-25. DTI WILL APPLY DIRECT EXPERIENCE AND PROPRIETARY KNOWLEDGE GAINED IN OTHER SUCCESSFUL APPLICATIONS OF ITS COMPRESSIBLE FLUID SUSPENSIONS TECHNOLOGY TO OTHER MILITARY VEHICLES AND HEAVY DUTY MINING TRUCKS. DTI WILL USE SILICONE AS THE COMPRESSIVE MEDIA TO INTEGRATE SPRING AND DAMPING FUNCTIONS INTO 8 INDIVIDUAL WHEEL UNITS, PROVIDING A LIGHTER, SIMPLIFIED SYSTEM THROUGH ELIMINATION OF TORSION BARS, BULKY SINGLE RATE SPRINGS, SEPARATELY MOUNTED SHOCK ABSORBERS AND OTHER ANCILLARY MOUNTING PIECES. THE DTI SYSTEM WILL FEATURE INDEPENDENT, ADJUSTABLE, SPRING AND DAMPING RATES FOR THE WIDEST RANGE OF VEHICLE WEIGHT CARRYING CAPACITY POSSIBLE WHILE IMPROVING THE RIDE CHARACTERISTICS AND OVERALL MISSION CAPABILITY. THE PRELIMINARY INVESTIGATIONS WILL START WITH COLLECTION OF ALL PRESENTLY KNOWN DATA ON THE LAV-25 INCLUDING STATIC AND DYNAMIC TEST MEASUREMENTS. DTI LAYOUT DRAWINGS AND ENGINEERING LOAD AND DAMPING CURVES WILL SHOW PACKAGING AND PERFORMANCE CAPABILITIES. DTI COMPUTER GENERATED CALCULATIONS AND SIMULATIONS WILL PROVIDE DATA NECESSARY TO DEMONSTRATE THE FEASIBILITY AND DESIRABILITY OF THE PROPOSED SYSTEM AND POTENTIAL VARIATIONS.

TAYLOR DEVICES INC
90 TAYLOR DR
N TONAWANDA, NY 14120
Program Manager: DOUGLAS P TAYLOR
Contract #:
Title: COMPRESSIBLE FLUID STRUT FOR WHEELED VEHICLES
Topic #: N90-026 Office: MCRDAC ID #: 40847

COMPRESSIBLE FLUID SUSPENSIONS ARE WIDELY USED WITHIN THE MILITARY TO PROTECT WEAPONS AND ELECTRONIC SYSTEMS FROM WEAPONS EFFECT SHOCK AND VIBRATION. THE ADAPTATION OF THIS TECHNOLOGY TO WHEELED AND TRACKED MILITARY VEHICLES WILL PROVIDE SIGNIFICANT IMPROVEMENT IN BOTH HANDLING AND RIDE. A SECOND BENEFIT OF THIS TYPE OF SUSPENSION IS THAT IT CAN EASILY ACCEPT EXTERNAL SENSOR INPUT, TO ALLOW ADAPTIVE RESPONSE CAPABILITY. THIS MEANS THAT SUSPENSION CHARACTERISTICS CAN BE READILY ALTERED TO ACCOMMODATE CHANGES IN VEHICLE GROSS WEIGHT, ROAD CONDITIONS, AND MISSION PROFILES. A THIRD BENEFIT IS THE RELATIVE SIMPLICITY OF THE COMPRESSIBLE FLUID SUSPENSION, AS COMPARED TO BOTH PNEUMATIC AND MECHANICAL DESIGNS HAVING ADAPTIVE CAPABILITY. A SIMPLE COMPRESSIBLE FLUID STRUT PROVIDES MAXIMUM CAPABILITY WITH A MINIMUM NUMBER OF PARTS. THIS PROPOSAL ADDRESSES THE DESIGN OF A COMPRESSIBLE FLUID SUSPENSION HAVING ADAPTIVE SPRING AND DAMPING CHARACTERISTICS. THE CANDIDATE VEHICLE IS THE USMC LAV-25, WITHIN WHICH AN ADEQUATE ENVELOPE EXISTS TO APPLY THE

PROPOSED TECHNOLOGY.

ATSS INC
PO BOX 5487
SAN BERNARDINO, CA 92412
Program Manager: LIAM S GROENER
Contract #:
Title: LIGHTWEIGHT COOLING COMPONENT DEVELOPMENT
Topic #: N90-028 Office: MCRDAC ID #: 40852

THE OBJECTIVE OF THE PROPOSED INNOVATION IS TO IMPROVE THE THERMAL PERFORMANCE AND REDUCE THE WEIGHT OF HEAT EXCHANGERS USED IN MILITARY COMBAT VEHICLES. THIS OBJECTIVE SHALL BE ACCOMPLISHED BY USING TECHNOLOGY THAT ATSS HAS DEVELOPED AND APPLIED IN THE DESIGN AND FABRICATION OF COMPACT-ACTIVELY COOLED STRUCTURES FOR USE IN HIGH HEAT FLUX ENVIRONMENTS. THIS TECHNOLOGY INVOLVES ETCHING SMALL PASSAGES IN LAMINATED METAL FOILS AND SUBSEQUENT DIFFUSION BONDING OF THE FOIL LAMINATES TO FORM COMPACT AND LIGHTWEIGHT HEAT EXCHANGERS. ANALYSES INDICATES THAT, RELATIVE TO CONVENTIONAL HEAT EXCHANGER DESIGNS, OVER A FACTOR OF FIVE REDUCTION IN CORE VOLUME CAN BE ACHIEVED WITH PROPOSED DESIGN/FABRICATION TECHNIQUES. WEIGHT REDUCTIONS WILL DEPEND ON THE METAL USED IN THE CURRENT NAVY SYSTEMS.

BELTRAN
1133 E 35TH ST
BROOKLYN, NY 11210
Program Manager: MICHAEL R BELTRAN
Contract #:
Title: A HEAT PIPE RADIATOR AS A LIGHTWEIGHT COOLING COMPONENT FOR MILITARY COMBAT VEHICLES
Topic #: N90-028 Office: MCRDAC ID #: 40851

THE PHASE I RESEARCH WILL ESTABLISH THE FEASIBILITY OF THE INNOVATIVE CONCEPT OF A HEAT PIPE RADIATOR AS A LIGHTWEIGHT COOLING COMPONENT FOR MILITARY COMBAT VEHICLES, THROUGH EXPERIMENTAL WORK. HEAT PIPES ARE HIGH EFFICIENCY LIGHTWEIGHT HEAT TRANSFER EQUIPMENT THAT HAVE NO MOVING PARTS. MOREOVER A HEAT PIPE NETWORK WILL CONTINUE TO WORK, EVEN IF, ONE OR MORE OF THE HEAT PIPES ARE DAMAGED. THIS ALMOST FAIL-SAFE CHARACTERISTIC HAS MADE HEAT PIPE A WIDELY USED EQUIPMENT IN SPACE APPLICATIONS, WHERE MICROMETEOROIDS POSE A THREAT THAT IS SIMILAR TO SMALL ARMS THREAT FACED BY MILITARY VEHICLES. THE PROPOSED ANALYSIS AND THE EXPERIMENTAL WORK WILL PROVIDE VALUABLE RESULTS ON THE PERFORMANCE OF THE HEAT PIPE RADIATOR, INCLUDING THE EFFECTIVENESS OF VARIOUS MATERIALS, WORKING FLUIDS, WICK STRUCTURE, AND THE OPERATING TEMPERATURE AND LOAD.

GLOBAL DEFENSE PRODUCTS INC
10 WATERSIDE PLAZA
NEW YORK, NY 10010
Program Manager: ANTHONY J CESARONI
Contract #:
Title: LIGHTWEIGHT COOLING SYSTEM DEVELOPMENT FOR AMPHIBIOUS TRACKER VEHICLES
Topic #: N90-028 Office: MCRDAC ID #: 40849

SIGNIFICANT PROGRESS HAS BEEN MADE RECENTLY IN THE AREA OF PLASTIC HEAT EXCHANGERS FOR AUTOMOTIVE USE. ADVANCES IN MATERIALS, DESIGN, AND METHOD OF MANUFACTURE HAVE PRODUCED A NEW GENERATION OF PLASTIC HEAT EXCHANGERS WHICH APPROACH OR EQUAL THE PERFORMANCE

LEVEL OF EXISTING METAL TYPES. SEVERAL RECENT PATENT CASES HAVE BEEN FILED ON THESE SYSTEMS. THESE HEAT EXCHANGERS NOT ONLY BENEFIT FROM THE OBVIOUS WEIGHT ADVANTAGE BUT ALSO, ENGINEERED PLASTICS THAT ARE UTILIZED IN THEIR CONSTRUCTION EXHIBIT EXCELLENT COMPATIBILITY IN ENVIRONMENTS CONTAINING GLYCOLS, HYDROCARBONS, AND OTHER CORROSIVE OR DEGRADING COMPOUNDS. PLASTIC HEAT EXCHANGERS HAVE BEEN USED IN THE INDUSTRY FOR MANY YEARS NOW WITH A GREAT DEAL OF SUCCESS IN THE CHEMICAL INDUSTRY, WHERE LIGHTWEIGHT, NON CORRODING HEAT EXCHANGERS ARE A REQUIREMENT. THESE TYPES OF EXCHANGERS HAVE BEEN TYPICALLY THE LIQUID TO LIQUID SHELL AND TUBE TYPE, AND WERE NOT SUITABLE FOR LIQUID TO AIR EXCHANGE. ALTHOUGH LIQUID TO AIR EXCHANGERS AND AIR TO AIR EXCHANGERS (CONSTRUCTED OF PLASTIC) DO EXIST, THEIR PERFORMANCE CAPABILITIES HAVE BEEN LIMITED DUE TO ENVIRONMENTAL CAPABILITY AND HEAT REJECTION CAPABILITY. THE NEW TYPE OF AMPHIBIOUS HEAT EXCHANGER DEVELOPED BY OUR GROUP MAY OFFER STRONG POTENTIAL IN THE AREA OF AMPHIBIOUS VEHICLES. THIS EXCHANGER SYSTEM EXHIBITS AN INCREASE IN HEAT REJECTION OF APPROXIMATELY 3 - 4 TIMES WHEN USED IN A WATER TO WATER APPLICATION OVER IT'S LIQUID TO AIR APPLICATION. GIVEN THE ADVERTISED HORSEPOWER AND HEAT REJECTION REQUIREMENTS OF THE PRIME MOVER PROPOSED IT IS FELT THAT RESEARCH AND DEVELOPMENT INTO THE APPLICATION OF THIS HEAT EXCHANGER SYSTEM WARRANTS INVESTIGATION.

DIESEL-DYNE CORP
3044 MIDDLEBORO RD
MORROW, OH 45152
Program Manager: RICHARD P JOHNSTON
Contract #:
Title: A STUDY OF AN ADVANCED VARIABLE CYCLE DIESEL ENGINE FOR USE IN A HIGH WATER SPEED AMPHIBIOUS VEHICLE
Topic #: N90-029 Office: MCRDAC ID #: 40853

THE PROPOSED STUDY WOULD ASSESS THE VIABILITY OF AN ADVANCED VARIABLE CYCLE DIESEL INSTALLED IN A HIGH WATER SPEED AMPHIBIOUS VESSEL. PERFORMANCE ON BOTH LAND AND WATER WOULD BE ASSESSED FOR A TYPICAL MISSION. THE INSTALLATION OF THE ENGINE WOULD BE CONSIDERED AND WEIGHTS, VOLUMES, AND ASSOCIATED EQUIPMENT CHARACTERISTICS DETERMINED. VARIOUS ARRANGEMENTS OF TURBOCHARGERS AND CONTROL SCHEDULES WOULD BE DEVELOPED TO INSURE THAT THE ENGINE PERFORMED WELL ON LAND OR WATER.

DYNA-CAM INDUSTRIES INC
105 N IRENA - #1
REDONDO BEACH, CA 90277
Program Manager: DENNIS C PALMER
Contract #:
Title: LIGHTWEIGHT/HIGH POWER DENSITY ENGINES
Topic #: N90-029 Office: MCRDAC ID #: 40854

THE OBJECTIVE OF THIS PROPOSAL IS TO GENERATE SEVERAL POSSIBLE SOLUTIONS TO THE 2300HP/750HP MISMATCH REQUIREMENTS FOR THE HIGH WATER SPEED AMPHIBIOUS VEHICLE. TO SOLVE THIS PROBLEM REQUIRES THE USE OF A VERY HIGH POWER DENSITY ENGINE WITH SMALL PROFILE. THE DYNA-CAM ENGINE IS THIS TYPE OF ENGINE. IT IS A UNIQUE ENGINE COMBINING THE BETTER FEATURES OF PISTON, ROTARY, AND TURBINE ENGINES. IT HAS PISTON FUEL ECONOMY, 50% TO 75% LESS PARTS (LIKE A ROTARY), AND STREAMLINE TURBINE SHAPE AND SMOOTHNESS. ABOUT 75% LESS SPACE IS NEEDED TO INSTALL. THREE DIFFERENT SIZE DYNA-CAM ENGINE DESIGNS WILL BE EVALUATED IN PHASE I. THESE WILL BE HIGH-POWERED 4-STROKE OR 2-STROKE LOOP-SCAVENGED ENGINES, EITHER DIESEL OR MULTI-FUEL. ONE MODEL OF WHICH CAN PRODUCE 750 HP, AND WEIGHS JUST 450 LB. DRY OR 550 LB. MARINIZED. IT IS 16" DIAMETER, THUS SMALL AS A TURBINE. IT CAN BE INSTALLED IN PLACES FAR TOO TIGHT FOR ANY OTHER ENGINE. THE CURRENT DYNA-CAM X-375 MODEL HAS BEEN INSTALLED IN A PIPER

AIRCRAFT (4-PLACE) THEREBY PROVING ITS RELIABILITY AND DEPENDABILITY FOR CRITICAL APPLICATIONS.

APPLIED TECHNOLOGY ASSOCS INC
PO BOX 14934
ORLANDO, FL 32814
Program Manager: DR ROBERT CAVALLERI
Contract #:
Title: LIGHT WEIGHT ROTARY COMPRESSOR EVALUATION FOR ADVANCED MARINE PROPULSION APPLICATIONS
Topic #: N90-030 Office: MCRDAC ID #: 40856

ROTARY COMPRESSORS ARE CAPABLE OF PROVIDING LARGER VOLUMES OF COMPRESSED GAS THAN RECIPROCATING MACHINES. THIS IS PRIMARILY RELATED TO THE FACT THAT ROTARY MACHINES CAN ROTATE AT HIGHER SPEEDS THAN RECIPROCATING DEVICES. A HIGH EFFICIENCY, LARGE DIS- PLACEMENT ROTARY COMPRESSOR OFFERS VERSATILITY AND FEATURES THAT EXISTING RECIPROCATING COMPRESSORS DO NOT POSSESS. AN ADVANCED MARINE PROPULSION CONCEPT THAT IS CURRENTLY UNDER CONSIDERATION REQUIRES THE COMBUSTION OF HIGH PRESSURE AIR IN CONJUNCTION WITH A COLUMN OF WATER TO PRODUCE A HIGH MOMENTUM WATER JET PROPULSION SYSTEM. THE PROPOSED ROTARY COMPRESSOR, WHICH WILL BE CONSIDERED IN THIS EFFORT, HAS FEATURES INCORPORATED INTO ITS DESIGN THAT MINIMIZE THE AMOUT OF INTERNAL LEAKAGE AND DECREASE THE INTERNAL FRICTION. A WORKING PROTOTYPE OF THE PROPOSED COMPRESSOR HAS BEEN FABRICATED AND TESTED ON A SMALLER SCALE THAN THAT REQUIRED FOR THE WATER JET PROPULSER. THE PROPOSED EFFORT WILL INVESTIGATE THE SCALE UP OF THIS COMPRESSOR TO MEET THE NEEDS OF THE WATER JET PROPULSER TO DETERMINE COMPRESSOR PERFORMANCE, WEIGHT AND CONFIGURATION OPTIMIZATION. THE COMPRESSOR PROPOSED HAS THE CAPABILITY OF VARIABLE PRESSURE RATIO. USE OF A VARIABLE PRESSURE RATIO COMPRESSOR MAY ALSO BE MORE ADAPTABLE TO VARYING POWER REQUIREMENTS. LIMITED EXPERIMENTAL TESTS WILL BE PERFORMED USING A ROTARY COMPRESSOR FOR COMPARISON TO THEORETICAL PREDICTIONS.

POLYCYCLE
5313 SOUTH AVE
BOARDMAN, OH 44512
Program Manager: THOMAS F BUTRYN
Contract #:
Title: LIGHTWEIGHT AIR COMPRESSORS
Topic #: N90-030 Office: MCRDAC ID #: 40855

THE MARINE CORPS HAS A NEED FOR LIGHTWEIGHT AIR COMPRESSORS FOR USE IN A REVOLUTIONARY IN-WATER PROPULSION SYSTEM NAMED THE WATER PISTON PROPULSER FOR PROPELLING FUTURE HIGH WATER SPEED AMPHIBIAN VEHICLES. THE REQUIREMENTS ARE FOR LIGHTWEIGHT, SALTWATER ENVIRONMENT CAPABLE COMPRESSORS THAT CAN PRODUCE 18.5 POUNDS PER SECOND OF AIR AT 225 psi. PHASE I OF THIS PROGRAM WILL BEGIN BY RESEARCHING COMPRESSOR DESIGNS, IDENTIFYING CRITERIA CRITICAL TO COMPRESSOR SELECTION AND FORMALIZING A SELECTION PROCEDURE. A COMPRESSOR DESIGN WILL BE SELECTED AND AN IMPROVED COMPUTER MODEL WILL BE DEVELOPED TO STUDY THIS DESIGN. PRELIMINARY COMPUTER AIDED DESIGN DRAWINGS WILL BE MADE AND ANALYZED USING THE COMPUTER MODEL. PRELIMINARY MATERIAL SPECIFICATIONS AND MANUFACTURING TOLERANCES WILL BE ESTABLISHED. RESULTS OF THIS WORK WILL BE REVIEWED AND A RECOMMENDED PROCEDURE WILL BE ESTABLISHED FOR FUTURE ITERATIONS OF DESIGN AND MODELING TO OPTIMIZE THE COMPRESSOR TO BE DONE IN PHASE II. PHASE II WILL ALSO INCLUDE DELIVERY OF FINAL DRAWINGS, ENGINEERING CALCULATIONS AND ADDITIONAL COMPUTER MODELING THAT DEMONSTRATE FEASIBILITY AND SHOW PACKAGING, LAYOUT, SYSTEM REQUIREMENTS, EFFICIENCIES, MODE OF OPERATION, WEIGHT AND VOLUME REQUIREMENTS.

AIL RESEARCH
18 CAMERON CT
PRINCETON, NJ 08540
Program Manager: DR ANDREW LOWENSTEIN
Contract #:
Title: MOBILE WATER PRODUCTION BY EXTRACTION OF ATMOSPHERIC MOISTURE IN DESICCANTS
Topic #: N90-031 Office: MCRDAC ID #: 40857

A HIGH-EFFICIENCY ATMOSPHERIC MOISTURE COLLECTION SYSTEM (AMCS) IS PROPOSED THAT USES A LIQUID DESICCANT TO EXTRACT WATER VAPOR FROM THE AIR. A STREAM OF POTABLE WATER IS RECOVERED FROM THE DESICCANT IN A SIMPLE BOILER. THE EFFICIENCY OF THE AMCS IS GREATLY IMPROVED BY USING AN ENGINE-DRIVEN COMPRESSOR TO RAISE THE PRESSURE OF THE STEAM FROM THE BOILER TO A LEVEL AT WHICH THE HEAT OF CONDENSATION CAN BE TRANSFERRED BACK TO THE BOILER. AT LOW AMBIENT RELATIVE HUMIDITIES, THE AMCS WOULD USE A SOLID DESICCANT TO FIRST CONCENTRATE THE WATER VAPOR BEFORE COLLECTING IT IN THE LIQUID DESICCANT ABSORBER. BASED ON EXISTING LIQUID-DESICCANT DEHUMIDIFIERS, AN AMCS THAT PRODUCES 375 LB/HR AT AN EFFICIENCY OF 16 GAL/GAL-FUEL WHEN AMBIENT HUMIDITES ARE MODERATE CAN BE EASILY CONTAINED IN AN ISO 8x8x20 ENCLOSURE AND WOULD WEIGH ABOUT 4600 LB. A VERY LOW AMBIENT HUMIDITIES (5%), WATER YIELDS WOULD BE 7 GAL/GAL-FUEL, BUT THE CAPACITY OF THE SYSTEM WOULD DROP TO AROUND 100 LB/HR. AN EXPERIENCED TEAM HAS BEEN ASSEMBLED FOR THIS REPORT, WHICH INCLUDES DR. ANDREW LOWENSTEIN--AN EXPERIENCED RESEARCHER IN THE FIELD OF LIQUID-DESICCANT DEHUMIDIFIERS--AND MR. WILLIAM GRIFFITHS--CHIEF ENGINEER AT KATHABAR, THE NATION'S LEADING MANUFACTURER OF LIQUID DESICCANT DEHUMIDIFIERS.

MAINSTREAM ENGINEERING CORP
200 YELLOW PL
ROCKLEDGE, FL 32955
Program Manager: DR ROBERT P SCARINGE
Contract #:
Title: DEVELOPMENT OF AN ATMOSPHERIC MOISTURE COLLECTION SYSTEM
Topic #: N90-031 Office: MCRDAC ID #: 40858

THE PROPOSED RESEARCH DESCRIBES A METHOD TO EXTRACT WATER FROM AIR WITH RELATIVE HUMIDITIES AS LOW AS 5% AND PRODUCTION OF 11.1 GALLONS OF WATER PER GALLON DIESEL FUEL CONSUMED. THE CONCEPT IS BASED ON THE USE OF AN INORGANIC HYDRATED SALT THAT WILL ACT AS A DESICCANT, AND CAN BE RECYCLED TO PRODUCE THE ANHYDROUS SALT AND WATER. THIS METHOD WILL ALSO BE COMPARED TO OTHER COMPETITIVE APPROACHES SUCH AS REFRIGERATION AND SEMIPERMEABLE MEMBRANES. THE PHASE I EFFORT IS AIMED AT DEMONSTRATING THE POTENTIAL OF MAINSTREAM'S WATER EXTRACTION SYSTEM. THE PROPOSED INNOVATION APPEARS TO HAVE SIGNIFICANT RELIABILITY, PERFORMANCE, AND WEIGHT BENEFITS OVER ALTERNATIVE APPROACHES. THIS INNOVATIVE SYSTEM USES A NON-TOXIC DESICCANT (SALT) AND WILL UTILIZE COMMON DIESEL FUEL AS THE ENERGY SOURCE.

AMMUNITION TECHNOLOGIES INC
5219 S 144TH ST
SEATTLE, WA 98168
Program Manager: MARLO VATSVOG
Contract #:
Title: POLYMERIC CARTRIDGE CASE
Topic #: N90-032 Office: MCRDAC ID #: 40860

THE OBJECT OF THIS EFFORT WILL BE A REDUCTION IN WEIGHT AND PRODUCTION COSTS, RELATING TO

THE CURRENT 5.56 BRASS CASED AMMUNITION CARRIED BY THE U.S. MILITARY FORCES. IT WILL INVOLVE THE EVALUATION OF MATERIALS AND DESIGNS USED BY AMMUNITION TECHNOLOGIES INC (A.T.I.) IN THE DESIGN AND CONSTRUCTION OF THE M193 PLASTIC CARTRIDGE CASE DEMONSTRATED AT FORT LEWIS WASHINGTON IN SEPTEMBER OF 1988. THESE MATERIALS AND DESIGNS TO THE EXTENT THEY MAY APPLY, WILL BE UTILIZED IN A M855 CONFIGURATION AND SUBJECTED TO TEST PROCEDURES. THIS EFFORT CAN BE CONDUCTED UTILIZING CURRENT A.T.I. TOOLING WITH SOME MODIFICATIONS FOR THE SS109 PROJECTILE. THE A.T.I. M193 PLASTIC CARTRIDGE CASE IS A THIN WALL DESIGN WHICH EMPLOYS A STEEL HEAD END, A PRESSURE BULK HEAD, CONVENTIONAL PRIMER AND POWDER. THIS THIN WALL DESIGN MAINTAINS SUFFICIENT INTERNAL PROPELLANT VOLUME TO ACHIEVE STANDARD BALLISTICS USING SMOKELESS POWDERS. THE EFFORT WILL CONSIST OF THE MODIFICATION OF A.T.I. M193 TOOLING, A CLOSE LOOK AT INTERNAL PROPELLANT VOLUMES AND A STUDY OF THE PEAK PRESSURE AND PROPELLANT PROFILE. CORRESPONDING EXTERNAL BALLISTICS WILL BE RECORDED.

CONCEPT ANALYSIS CORP
14789 KEEL ST
PLYMOUTH, MI 48170
Program Manager: DR DAVE ROURK
Contract #:
Title: DEVELOPMENT PROTOTYPE PRODUCTION TEST AND DEMONSTRATION OF THE NEW M855 CARTRIDGE (POLYMERIC CASE)
Topic #: N90-032 Office: MCRDAC ID #: 40859

IT IS DESIRED TO REDUCE BOTH THE COST AND THE WEIGHT OF THE CURRENT M855 CARTRIDGE. THE CARTRIDGE CASE IS THE MOST VIABLE COMPONENT OF THE ASSEMBLY IN WHICH SIGNIFICANT IMPROVEMENT CAN BE MADE. CONCEPT ANALYSIS CORPORATION (CAC) PROPOSES HEREIN A PROTOTYPE *DESIGN OF THE NEW M855 CARTRIDGE. THIS* DESIGN MAKES EXTENSIVE USE OF A GLASS FIBER-REINFORCED POLYMERIC RESIN AND IS PROJECTED TO REDUCE THE WEIGHT OF THE CARTRIDGE CASE ALONE BY 67%. THE TOTAL M855 CARTRIDGE WOULD THEN WEIGH 33% LESS. INJECTION MOLDING IS HEAVILY RELIED UPON AS A MANUFACTURING OPERATION, THEREFORE SIGNIFICANT COST SAVINGS ARE EXPECTED WHEN LARGE VOLUME PRODUCTION IS UNDERTAKEN. RAW MATERIAL COSTS OF THE NEW DESIGN ARE APPROXIMATELY 21% OF THOSE FOR THE CURRENT DESIGN. THE DESIGN ADDRESSES ALL MAJOR LOADINGS THE M855 ROUND WILL UNDERGO IN THE M16A2 AND M249 WEAPONS. THESE LOADINGS INCLUDE: INTERNAL PRESSURE, TEMPERATURE AND CREEP, MAGAZINE (INCLUDING CASE TEAR), BULLET EXTRACTION (CRIMPING) AND RIM SHEAR. THE PROBLEM OF CASE JAMMING WILL BE REDUCED WITH THE NEW DESIGN. THE DESIGN IS EXPECTED TO MEET OR EXCEED THE REQUIREMENTS (INCLUDING BULLET VELOCITY) IN MIL-C-63989A(AR), THE MILITARY SPECIFICATIONS FOR THE M855 ROUND.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
Program Manager: PAUL A CHAMBERS
Contract #:
Title: STAND-OFF MINEFIELD MARKING FOR VERY SHALLOW WATER (VSW) SURF ZONE AND BEACH
Topic #: N90-033 Office: MCRDAC ID #: 40862

EARLY IN THE LODGEMENT PHASE OF ANY AMPHIBIOUS ASSAULT IS WHEN THE LANDING FORCE IS AT ITS MOST VULNERABLE. THE ASSAULT ELEMENTS MUST BEACH AND MARK CLEARED LANES IN MINEFIELDS FROM THE VERY SHALLOW WATER ZONE THROUGH THE SURF AND ACROSS THE BEACH TO ENABLE EARLY BUILDUP OF EFFECTIVE COMBAT POWER. NO SYSTEM CURRENTLY EXISTS TO FULFILL THE ROLE OF STAND-OFF CLEARED LANE MARKING. IN THIS PROPOSAL FOSTER-MILLER WILL INITIALLY ANALYZE THE SYSTEM TECHNICAL AND OPERATIONAL REQUIREMENTS TO ARRIVE AT AN OPTIMUM MARKET DESIGN.

AVAILABLE SUPPORT WEAPON SYSTEMS INCLUDING THE BEACH SYSTEM ITSELF, WILL BE SURVEYED AND ANALYZED WITH THE AIM OF SELECTING THE SYSTEM MOST SUITED TO THE ROLE OF MARKER DELIVERY VIA MODIFICATION OF AN EXISTING MUNITION. MARKER AND DELIVERY SYSTEM WILL BE CONCEPTUALLY INTEGRATED TO ARRIVE AT A DESIGN PROVING BOTH THE TECHNICAL AND OPERATIONAL FEASIBILITY OF SUCH A CLEARED LANE MARKING SYSTEM.

MASSA PRODUCTS CORP
280 LINCOLN ST
HINGHAM, MA 02043
Program Manager: FRANK MASSA
Contract #:
Title: STANDOFF MINEFIELD MARKING FOR VERY SHALLOW WATER
Topic #: N90-033 Office: MCRDAC ID #: 40861

A NEED EXISTS FOR MARKING CLEARED LANES THROUGH MINEFIELDS. TWO PROPOSED LANE MARKING SYSTEMS WILL PERMIT THE BEST SELECTION FOR THE PREVAILING CONDITIONS. PHASE I WILL BUILD BREADBOARD TO DEMONSTRATE EACH SYSTEM. ONE SYSTEM USES CODED TRANSPONDERS APPROXIMATELY 1" DIAMETER MOUNTED ON TOP OF A TUBULAR EXTENSION FROM A TRIANGULAR 3-PRONG BASE THAT SERVES AS AN ANCHOR TO POSITION THE TRANSPONDERS ON THE BOTTON WHEN THEY ARE DROPPED IN LEFT AND RIGHT-HAND CODED PAIRS FROM THE SIDES OF THE MINEFIELD BREACHING VESSEL AS IT CLEARS A LANE FOR THE PASSAGE OF THE ASSAULT FORCES. THE LANDING CRAFT USES A PORTABLE RECEIVER THAT PERIODICALLY TRANSMITS A SONAR PULSE AS IT PROCEEDS ALONG THE CLEARED LANE. WHEN THE NEXT BOTTOM-MOUNTED TRANSPONDER PAIR RECEIVES THE SONAR PULSE THEY EACH INSTANTLY TRANSMIT A CODED SIGNAL. THE DIFFERENCE IN ARRIVAL TIME OF THE CODED SIGNALS, INDICATED ON A METER ON THE LANDING CRAFT, SHOWS THE OFF- CENTER CORRECTION REQUIRED TO KEEP THE VESSEL MOVING ALONG THE CENTER OF THE CLEARED LANE. A SECOND BREADBOARD SYSTEM WILL BE BUILT IN PHASE I WHICH WILL INCLUDE A NUMBER OF TRANSPARENT PLASTIC SPHERES (50% RED AND 50% GREEN). EACH SPHERE IS ATTACHED TO THE END OF A NYLON CORD WHICH IS CONTTAINED ON A SMALL SPOOL MOUNTED INSIDE A WEIGHT MEMBER WHICH SERVES AS AN ANCHOR FOR THE ASSEMBLY. INSIDE EACH SPHERE IS A FLASHLIGHT BULB AND BATTERY SUFFICIENT FOR A 2-HOUR LIFE AS SPECIFIED. AT THE END OF TWO HOURS, A SOLUBLE PLUG ON THE SPHERE ADMITS WATER TO SINK THE LANE MARKERS.

SPARTA INC
23041 AVENIDA DE LA CARLOTA - STE 400
LAGUNA HILLS, CA 92653
Program Manager: HARRY DYNER
Contract #:
Title: STANDOFF MINEFIELD MARKING FOR VERY SHALLOW WATER (VSW) SURF ZONE AND BEACH
Topic #: N90-033 Office: MCRDAC ID #: 40863

A NEED EXISTS TO MARK LANES CLEARED THROUGH MINEFIELDS IN VERY SHALLOW WATER, SURF ZONE AND BEACH SO THAT ASSAULT VEHICLES AND LANDING CRAFT CAN BE GUIDED SAFELY TO THE BEACH. SPARTA PROPOSES TO INVESTIGATE AND DEMONSTRATE THE COST-BENEFIT OF GPS LOCATORS ON THE BREACHING VEHICLE AND ASSAULT VEHICLE LOCATION AND A DIGITAL DISPLAY MAP SHOWING THE CLEARED LANE AND THE ASSAULT VEHICLE LOCATION TO PROVIDE STANDOFF MINEFIELD MARKING. A DETAILED ENGINEERING DESIGN WILL BE DEVELOPED FOR TESTING DURING PHASE II AGAINST SPECIFIC SYSTEM AND OPERATIONAL REQUIREMENTS, INCLUDING PACKAGING, VOLUME, WEIGHLY, POWER AND METHOD OF OPERATION.

INTECH INC
7 DEVON ST

ROBBINSVILLE, NJ 08691
Program Manager: DAVID ANDERSON
Contract #:
Title: USE OF NEURAL NETS IN PREDICTING PERSONNEL ATTRITION
Topic #: N90-034 Office: MCRDAC ID #: 40864

THE APPLICATION OF NEURAL NETWORK TECHNIQUES TO PREDICTING PERSONNEL ATTRITION CAN HAVE SEVERAL ADVANTAGES OVER CONVENTIONAL APPROACHES SUCH AS TIME SERIES METHODS AND ECONOMETRIC MODELS. THE POWER OF THE NEURAL NETWORK APPROACH HAS BEEN DEMONSTRATED BY THEIR ABILITY TO REPRESENT NONLINEAR MAPPING NETWORKS, AND TO SUCCESSFULLY MANAGE MULTIVARIATE DATA. THIS PHASE I PROGRAM WILL IDENTIFY AND CHARACTERIZE THE VARIABLES THAT HAVE THE STRONGEST INFLUENCE ON AN INDIVIDUALS LIKELIHOOD OF ATTRITION. SECONDLY, A NEURAL NETWORK BASED MODEL WILL BE DEVELOPED UTILIZING THE SELECTED INPUT VARIABLES TO PREDICT PERSONNEL ATTRITION RATES. FINALLY, A THOROUGH COMPARISON BETWEEN THE DEVELOPED MODEL AND EXISTING METHODS WILL BE PRESENTED. THIS PROJECT IS EXPECTED TO PROVIDE A SOLID FOUNDATION FOR A PHASE II DEVELOPMENT OF A COMPLETE MANPOWER PLANNING TOOL. WITH THE EXPECTED INCREASE IN PERFORMANCE FROM THE PROPOSED METHOD, FOLLOW FUNDING IS FULLY EXPECTED.

SCIENTIFIC SYSTEMS CO
500 W CUMMINGS PK - STE 3950
WOBURN, MA 01801
Program Manager: R VENUGOPAL
Contract #:
Title: USE OF NEURAL NETWORK TECHNOLOGY IN PREDICTING PERSONNEL ATTRITION
Topic #: N90-034 Office: MCRDAC ID #: 40865

MILITARY LOSS FORECASTING IS AN IMPORTANT PROBLEM FOR SEVERAL REASONS. PERSONNEL LOSSES ARE COSTLY BECAUSE THEY INCREASE THE NUMBER OF PEOPLE WHO MUST BE RECRUITED AND TRAINED. MORE SERIOUS IS THE PROSPECT OF MILITARY MISSIONS DEGRADED BY MANPOWER SHORTAGES. THERE ARE SEVERAL DIFFERENT TYPES OF FORECASTING METHODOLOGIES IN USE AT THE PRESENT TIME. FOR EXAMPLE ORDINARY LEAST SQUARES STEPWISE REGRESSION BASED ON INDIVIDUAL CHARACTERISTICS AND A VERSION OF ODDS-FOR-EFFECTIVENESS TABLES TO ESTIMATE ATTRITION PROBABILITY ARE USED BY AIR FORCE AND NAVY TO PREDICT LOSSES ON AN INDIVIDUAL BASIS. IN ALL THESE CASES THERE ARE SOME PREJUDICES OF THE RESEARCHERS BUILT INTO THE MODEL AND IT IS TIME TO STUDY MODELS WHICH LOOK ONLY AT THE DATA AND NOTHING ELSE. NEURAL NETWORK TECHNOLOGY HAS GIVEN US THIS PRIVILEGE OF CREATING MODELS WHICH TRAIN THEMSELVES ON THE DATA AND THERE BY REMOVING ALL THE ASSUMPTIONS BUILT INTO CURRENT FORECASTING TECHNIQUES. DARPA NEURAL NETWORK STUDY RECOMMENDS GMDH AS ONE OF THE MOST USEFUL TECHNIQUES IN CLASSIFICATION AND MODELING. WE HAVE DEVELOPED A TECHNIQUE FOR FURTHER REFINEMENT ON THE GMDH TECHNIQUE WHICH INCORPORATES DIFFERENT TYPES OF LEARNING TECHNIQUES, ENABLING US TO CREATE A NEURAL NETWORK ARCHITECTURE WITH OPTIMAL COMPLEXITY. WE ALSO PROPOSE AN ALTERNATE METHOD TO UTILIZE THE NEURAL NETWORK TECHNOLOGY DEVELOPED USING LARS AND INTELEHEDRON DEVELOPED BY OUR COLLABORATORS FROM GTE, IN THIS STUDY.

CMS RESEARCH CORP
1075 S 13TH ST - STE 205
BIRMINGHAM, AL 35205
Program Manager: DR DANIEL R COLEMAN
Contract #:
Title: STUDY TO OBTAIN A SIMULANT FOR TESTING VX CONVERSION FILTERS
Topic #: N90-036 Office: MCRDAC ID #: 40866

AGENT VX HAS A VERY LOW VAPOR PRESSURE AND IS QUITE REACTIVE. FOR THESE REASONS, IT HAS A TENDENCY TO ABSORB OR REACT IRREVERSIBLY ON MOST MATERIALS AND, THUS, THE QUANTITATIVE TRANSPORT OF VX THROUGH KEY COMPONENTS IN CW-AGENT DETECTORS IS DIFFICULT. FOR THIS REASON, IT IS COMMON TO DETECT VX AS ITS MORE VOLATILE "G-ANALOG" BY FIRST PASSING THE GAS STREAM ENTERING A DETECTOR THROUGH A SILVER- FLOURIDE-IMPREGNATED FILTER. ALTHOUGH THIS FILTER IS SUITABLE IN MANY APPLICATIONS, IT IS QUITE UNSTABLE AND, THUS, THERE IS NEED FOR OTHER CONVERSION SUBSTRATES. VARIOUS REAGENT/MEMBRANE COMBINATIONS FOR USE AS A VX CONVERSION FILTER ARE COURRENTLY BEING DEVELOPED UNDER THE MARINE CORPS CHEMICAL/BIOLOGICAL DEFENSE TECHNOLOGY PROGRAM THROUGH THE U.S. ARMY CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (CRDEC). THE PURPOSE OF THE WORK DESCRIBED IN OUR PROPOSAL IS TO DEVELOP A SAFE AND COST-EFFECT VX SIMULANT FOR USE IN EVALUATING THE STABILITY OF VX CONVERSION FILTERS.

CAMAS DIAGNOSTIC CO
1313 FIFTH ST SE - STE 219
MINNEAPOLIS, MN 55414
Program Manager: DR PETER NASH
Contract #:
Title: NOVEL APPARATUS FOR DETECTING BIOLOGICAL AGENTS
Topic #: N90-037 Office: MCRDAC ID #: 40867

THE US MARINE CORPS HAS A DIRECT NEED TO MAINTAIN THE HEALTH AND FUNCTIONAL EFFECTIVENESS OF ITS PERSONNEL AGAINST A VARIETY OF DANGEROUS BIOLOGICAL AGENTS. METHODS TO DETECT THESE AGENTS IN ENVIRONMENTAL OR FIELD SAMPLES MUST BE DEVELOPED FOR USE IN THE NBC LABORATORY PROGRAM. THE PROPOSED NOVEL RAPID DETECTION SYSTEM CAN BE USED TO MONITOR BIOLOGICAL AGENTS IN FIELD ENVIRONMENTAL SAMPLES. THE INNOVATIVE SYSTEM UTILIZES AN ENCLOSED APPARATUS AND DRY CHEMISTRY ALLOWING FOR PROTECTION OF THE USER AND LONG-TERM STORAGE. THE NOVEL FORMAT ELIMINATES THE NEED FOR MICROBIAL GROWTH OR LIQUID SUBSTRATE REAGENTS; PROVIDES A READOUT IN TEN MINUTES; IS SENSITIVE; UTILIZES SPECIFIC REAGENTS FOR DETECTING BIOLOGICAL AGENTS WHILE REQUIRING SMALL SAMPLE SIZES. THE READILY DISCERNABLE "YES/NO" ANSWER AND UNAMBIGUOUS INTERPRETATION ARE ADVANTAGES OVER CURRENT PROCEDURES. THE APPARATUS WILL ELIMINATE SAMPLE HANDLING PROBLEMS AND BIOHAZARDS FROM SAMPLE PROCESSING. THE SPECIFIC OBJECTIVES FOR THIS RESEARCH EFFORT ARE TO: 1) PROCURE SPECIFIC ANTIGENS AND ANTIBODIES, 2) CONJUGATE ANTIGENS AND ANTIBODIES, 3) PREPARE AND OPTIMIZE ASSAY COMPONENTS AND 4) ASSEMBLE AND USE-TEST THE FORMAT USING TWO MODEL MICROORGANISMS. REAGENTS WILL BE STABILIZED AND ACTIVE FOR ONE YEAR.

NEW HORIZONS DIAGNOSTICS
9110 RED BRANCH RD
COLUMBIA, MD 21045
Program Manager: DAVID BERNSTEIN
Contract #:
Title: TEST KIT DEVELOPMENT FOR AGENTS OF BIOLOGICAL ORIGIN
Topic #: N90-037 Office: MCRDAC ID #: 40868

NEW HORIZONS DIAGNOSTICS (NHD) HAS SEVERAL PATENTS FOR NOVEL RAPID AND SIMPLE LIGAND-RECEPTOR ASSAYS. NHD'S GOAL HAS BEEN TO PRODUCE ASSAYS SIMPLE ENOUGH TO BE PERFORMED BY UNSKILLED OR UNTRAINED INDIVIDUALS WITHOUT ANY EQUIPMENT NEEDS. THROUGH THE COMMERCIAL INTRODUCTION OF THE DIRECT GROUP A STREP SMART (SENSITIVE MEMBRANE ANTIGEN RAPID TEST), NHD HAS PROVEN ITSELF TO BE IN THE FOREFRONT OF RAPID IMMUNO-DIAGNOSTIC TECHNOLOGY. THE GROUP A STREP SMART CAN DETECT AS FEW AS 2000 STREPTOCOCOCCI FROM A SWAB IN LESS THAN 7 MINUTES. IN CLINICAL EVALUATION, THE SMART HAS PROVEN TO BE MORE SIMPLE AND SIGNIFICANTLY MORE SENSITIVE THAN LATEX AGGLUTINATION, ELISA-MEMBRANE, OR

LIPOSOME-MEMBRANE BASED GROUP A STREP ASSAYS. THE SMART PROCEDURE USES A SWAB FOR SAMPLE COLLECTION, WHICH IS REACTED WITH A METAL SOL LABELED ANTIBODY AND THEN PLACED IN A SMART DEVICE WHEREIN ANY IMMUNOCOMPLEXES FORMED ARE CAPTURED ON A MEMBRANE, APPEARING AS A PINK TO PURPLE SPOT. THE SMART KIT IS STORED AND PERFORMED AT ROOM TEMPERATURES AND THEREFORE IS CAPABLE OF BEING USED AS A FIELD DETECTION/IDENTIFICATION KIT. IN THE PHASE I PROGRAM, A PROTOTYPE RAPID AND SIMPLE ASSAY IN THE SMART FORMAT WILL BE DEVELOPED FOR 2 PATHOGENS OR TOXINS OF INTEREST TO THE CONTRACTOR. THE SPECIFIC ANTIBODIES AND ANTIGEN WOULD BE PROVIDED BY THE CONTRACTOR. WE WILL ALSO EXAMINE THE FEASIBILITY OF TESTING TWO AGENTS FROM A SINGLE SWAB SIMULTANEOUSLY WITHIN A SINGLE SMART DEVICE.

APTEK INC
1257 LAKE PLAZA DR
COLORADO SPRINGS, CO 80906
Program Manager: KENNETH E SIEGENTHALER
Contract #:
Title: FIBER OPTIC WEAPONS SIGHT
Topic #: N90-039 Office: MCRDAC ID #: 40870

THIS PROPOSAL IS TO USE OPTICAL FIBER GRADED-INDEX (GRIN) ROD LENSES TO DEVELOP A WEAPONS SIGHT THAT HAS MAGNIFICATION, A BRIGHT IMAGE, REQUIRES THE EYE TO ONLY FOCUS AT ONE DISTANCE, IS RUGGED, IS ACCURATE, IS SIMPLE, IS SMALL, IS USER FRIENDLY, AND IS COMPATABLE TO BE MOUNTED ON EXISTING WEAPONS. THE PROGRAM INCLUDES VALIDATING THE CONCEPT, FABRICATING A TEST UNIT, AND TESTING THE UNIT ON A M16A2 RIFLE. THE RESULTS OF THE STUDY WILL BE PRESENTED IN A FINAL REPORT.

OPTICS 1 INC
3625 THOUSAND OAKS BLVD - STE L
WESTLAKE VILLAGE, CA 91362
Program Manager: ROBERT E FISCHER
Contract #:
Title: FIBER OPTIC WEAPONS SIGHT
Topic #: N90-039 Office: MCRDAC ID #: 40869

IRON WEAPON SIGHTS HAVE THE PROBLEM OF THE EYE NEEDING TO FOCUS AT THE REAR AND FRONT SIGHTS AS WELL AS THE OBJECT, ALL SIMULTANEOUSLY-- AN IMPOSSIBLE TASK. TELESCOPIC RIFLE SIGHTS SOLVE THIS PROBLEM BY PERMITTING THE EYE TO BE FOCUSSED AT OR NEAR INFINITY, AND AT THE SAME TIME SEE BOTH THE OBJECT AS WELL AS A RETICLE FOR AIMPOINT ASSESSMENT. HOWEVER, THESE FORMS OF SIGHTS ARE COMPLEX OPTO- MECHANICAL DEVICES WITH MULTIPLE LENSES AND IN SOME CASES PRISMS IN ORDER TO PRESENT THE USER WITH AN ERECT IMAGE. THIS SBIR WILL INTEGRATE COHERENT FIBER OPTIC BUNDLES INTO THE RIFLE SIGHT IN ORDER TO SIMPLIFY, RUGGEDIZE, AND REDUCE THE PRODUCTION COST OF WEAPONS SIGHTS. COHERENT MONOLITHIC FIBER OPTIC BUNDLES HAVE BEEN DEMONSTRATED WHICH ROTATE AN IMAGE BY 180 DEGREES, AND SUCH A DEVICE CAN BE USED TO ELIMINATE THE CONVENTIONAL ERECTING OPTICS (EITHER RELAY LENSES OR A COMPLEX PRISM ASSEMBLY). FURTHERMORE, TAPERED BUNDLES CAN INTRODUCE A MAGNIFICATION, AND THIS MAY PROVE ADVANTAGEOUS. IN THIS SBIR OPTICS 1, INC. WILL DEVELOP AND PRODUCE SIX LOW COST, RUGGEDIZED, AND SIMPLE WEAPONS SIGHTS USING COHERENT FIBER OPTICS BUNDLES. OTHER TECHNIQUES CURRENTLY UNDER DEVELOPMENT BY OPTIC 1, INC. MAY BE ABLE TO BE INCORPORATED INTO THE SIGHT TO ENHANCE THE ABILITY OF THE USER TO QUICKLY AND EFFICIENTLY AIM THE WEAPON.

MEMBRANE TECHNOLOGY & RESEARCH INC
1360 WILLOW RD - STE 103

MENLO PARK, CA 94025
Program Manager: DR AMULYA ATHAYDE
Contract #:
Title: PERMSELECTIVE/SORPTIVE COMPOSITE FABRICS
Topic #: N90-040 Office: MCRDAC ID #: 40871

THIS PROPOSAL DESCRIBES THE DEVELOPMENT OF ADVANCED PERMSELECTIVE/SORPTIVE FABRICS BASED ON SORBENT-LOADED, PERMSELECTIVE MEMBRANES. A MICROPOROUS POLYMER FILM WITH ASYMMETRIC PORES LOADED WITH SORBENT PARTICLES FORMS THE BASE FOR A THIN, DENSE FILM OF PERMSELECTIVE POLYMER MATERIAL. THE PERMSELECTIVE LAYER IS HIGHLY PERMEABLE TO WATER VAPOR BUT SIGNIFICANTLY REDUCES THE PERMEATION OF OTHER CHEMICAL SPECIES. ANY CHEMICAL AGENT THAT DOES PERMEATE THROUGH THIS LAYER IS REMOVED BY SORBENT IN THE POROUS SUPPORT. CONSEQUENTLY, THE FABRIC CAN BE MADE MUCH THINNER AND LIGHTER THAN CONVENTIONAL FABRICS. THE SELECTIVE PERMEATION OF WATER VAPOR FROM WITHIN THE SUIT FACILITATES THE REMOVAL OF PERSPIRATION VAPOR AND MINIMIZES THE RISK OF HEAT STRESS. THE PHASE I PROGRAM WILL DEMONSTRATE THE FEASIBILITY OF THIS APPROACH, AND DETERMINE THE SUITABILITY OF THE MATERIAL FOR GARMENT FABRICATION. SCALE-UP OF MATERIAL PRODUCTION TO COMMERCIAL WIDTHS AND LENGTHS WILL BE PERFORMED IN PHASE II.

PERFECT VIEW INC
3909 BERYL RD
RALEIGH, NC 27606
Program Manager: THOMAS WILKE/ A J ATTAR
Contract #:
Title: CHEMICAL WARFARE PROTECTIVE GARMENT
Topic #: N90-041 Office: MCRDAC ID #: 40872

PROTECTIVE CLOTHING IS ESSENTIAL TO MAINTAINING OPERATIONS AND SAVING LIVES IN ENVIRONMENTS CONTAINING TOXIC MATERIALS, E.G., WARFARE CHEMICALS (WC). UNFORTUNATELY, TRADITIONAL APPROACHES TO PROTECTIVE CLOTHING HAVE RESULTED IN A TRADE-OFF BETWEEN QUALITY OF PROTECTION VS. PHYSICAL AND HEAT-STRESS BURDEN ON THE USER. THE LESS PERMEABLE FABRICS BLOCK WC BETTER BUT ALSO BLOCK THE EVAPORATION OF SWEAT AND THUS COOLING OF THE WEARER WHO HAS TO CONTINUE AND FUNCTION UNDER INCREASED STRESS. PRELIMINARY STUDIES IN OUR LABORATORY SUGGEST THAT CERTAIN MATERIALS CAN BE ADDED TO THE FABRIC THAT (1) CATALYZE THE HYDROLYTIC REACTION BETWEEN SWEAT AND WC AND THUS ENHANCE THE RATE OF THEIR DETOXIFICATION, (2) DO NOT RESTRICT AND POSSIBLY INCREASE THE RATE OF WATER PERMEATION AND THUS REDUCE THE HEAT STRESS OF THE WEARER AND (3) ARE POTENTIALLY LIGHT-WEIGHT MATERIALS WHICH ARE COMPATIBLE WITH EXISTING GARMENT MANUFACTURING TECHNOLOGY. THE MAIN OBJECTIVES OF THE PROPOSED WORK ARE TO IDENTIFY THE IDEAL FABRIC-ADDITIVES/CATALYSTS FOR THE HYDROLYTIC DETOXIFICATION OF WC AND TO DETERMINE THEIR EFFECT ON THE RATE OF WATER AND OF WC PERMEATION THROUGH THE FABRIC. THE USE OF FABRICS MODIFIED IN THIS MANNER WILL IMPROVE AND INCREASE THE POSSIBLE LENGTH OF WORK AND THE PERFORMANCE OF SOLDIERS IN CONTAMINATED ENVIRONMENTS AND WILL SAVE LIVES DUE TO REDUCED EXPOSURE AND/OR STRESS.

GEO-CENTERS INC
7 WELLS AVE
NEWTON CENTRE, MA 02159
Program Manager: DR SYAMA CHAUDHURI
Contract #:
Title: HANDHELD MINE DETECTOR IMAGER/DISCRIMINATION
Topic #: N90-042 Office: MCRDAC ID #: 40874

COMPLEMENTARY SENSOR TECHNOLOGIES COMPRISED OF HIGH RESOLUTION GROUND PENETRATING RADAR (GPR), PULSED INDUCTION (PI) AND ACOUSTIC/ NUCLEAR SENSOR WILL BE INDIVIDUALLY RESEARCHED AND MODELED SPECIFICALLY FOR APPLICATION AND SUBSEQUENT INTEGRATION AS A HANDHELD LANDMINE DETECTOR IMAGER/DISCRIMINATION. DURING THE FIRST PHASE OF THE RESEARCH, GEO-CENTERS, INC. WILL PERFORM AN IN-DEPTH PRACTICAL EXAMINATION OF THE CURRENT STATE-OF-THE-ART IN THE GENERAL AREAS OF METAL DETECTION AND IMAGING; SOIL DIELECTRIC CONSTANTS, DENSITIES AND COMPACTION CHARACTERISTICS; INTERFACES BETWEEN MAN-MADE AND NATURAL OBJECTS, SIGNALS RETURN RATES AND RADIATED VARIABLES. THE REASEARCH WILL ALSO FOCUS ON THE MATHEMATICAL ASPECTS OF THE DATA PROCESSING, MULTISENSOR DATA FUSION, TARGET RECOGNITION (DETECTION AND CLASSIFICATION), PROBABILITY OF DETECTION AND FALSE ALARM, AND THE MINE RECOGNITION OPERATING CHARACTERISTICS. THE PHASE II STUDY WILL CONSIDER THE IMPLEMENTATION OF THE TIME RECOGNITION SYSTEM'S PHYSICAL CHARACTERISTICS INCLUDING THE SOFTWARE AND HARDWARE. IN THE PHASE III, WE WILL CONDUCT A FIELD TEST TO VALIDATE THE DEVELOPMENTS MADE IN PHASE I AND II STUDIES.

H.M. TECHNOLOGIES INC
PO BOX 1417/A-11
ALEXANDRIA, VA 22313
Program Manager: WILLIAM S BLACK
Contract #:
Title: HAND HELD MINE DETECTOR IMAGER/DISCRIMINATION
Topic #: N90-042 Office: MCRDAC ID #: 40873

PRELIMINARY RESEARCH TO EVALUATE THE MERITS AND LIMITATIONS OF VARIOUS COIL DESIGNS AND THE CONCEPT FEASIBILITY OF A PULSED EDDY CURRENT IMAGING MINE DETECTOR.

PROCESSING RESEARCH INC
8027 LEESBURG PIKE - STE 201
VIENNA, VA 22182
Program Manager: DUDLEY C EDGEMON
Contract #:
Title: HANDHELD MINE DETECTOR IMAGER/DISCRIMINATOR
Topic #: N90-042 Office: MCRDAC ID #: 40875

THIS PROPOSAL PRESENTS AN APPROACH TO DEVELOPMENT OF A PROOF OF CONCEPT MODEL FOR A HANDHELD MINE DETECTOR IMAGER/DISCRIMINATION SYSTEM. THE DESIGN WILL PROVIDE FOR DETECTION OF BOTH METALLIC AND NONMETALLIC BURIED LAND MINES UNDER ALL WEATHER/VISIBILITY CONDITIONS. IT WILL ALLOW IMPROVED IDENTIFICATION/FALSE TARGET DISCRIMINATION THROUGH USE OF IMAGING AND IMAGE ENHANCEMENT TECHNIQUES. THE DESIGN WILL BE AMENABLE TO INCORPORATION IN A MAN PORTABLE HANDHELD SERVICE. A SYSTEMATIC APPROACH WILL BE USED TO EVALUATE CURRENT AND PROJECTED MINE DETECTION TECHNOLOGIES ON THE BASIS OF THEIR ABILITY TO PROVIDE THE FOUNDATION OF A HANDHELD DETECTION SYSTEM. VARIOUS TYPES OF DISPLAY SYSTEMS AVAILABLE AND IMAGING TECHNIQUES WILL BE EVALUATED FOR THEIR CAPABILITY TO ACCOMMODATE THE DETECTION SYSTEM CHARACTERISTICS AND THEIR ABILITY TO MEET THE MINIMUM WEIGHT, SIZE, AND POWER CONSUMPTION REQUIREMENTS OF A MAN PORTABLE SYSTEM. THE EFFORT WILL CONSIST OF EVALUATING AND COMPARING MINE DETECTION TECHNOLOGIES BASED ON AVAILABLE DOCUMENTATION, DEVELOPING A FEASIBILITY TEST MODEL TO QUANTIFY AND COMPARE PERFORMANCE, DEVELOPING A BASIC SYSTEM DESIGN FOR THE SELECTED TECHNOLOGY, AND PREPARING A PLAN FOR THE DEVELOPMENT OF A PROOF OF CONCEPT MODEL.

SCHWARTZ ELECTRO-OPTICS INC

3404 N ORANGE BLOSSOM TRAIL
ORLANDO, FL 32765
Program Manager: DR MADHU ACHAREKAR
Contract #:
Title: DIVERSION DEVICE/INCAPACITANT
Topic #: N90-043 Office: MCRDAC ID #: 40876

A DIVERSION DEVICE/INCAPACITANT BASED ON A CHEMICAL PUMP SOLID STATE LASER TO FLASH-BLIND AN OPPONENT WITHOUT INJURING NEARBY INNOCENT PERSONNEL WILL BE STUDIED IN THIS PROGRAM. THE RECENT DATA COLLECTED AT SCHWARTZ ELECTRO-OPTICS (SEO) INDICATES THE FEASIBILITY OF A CHEMICAL PUMPED SOLID STATE LASER. THE DEVICE EMITS HIGH POWER PHOTON BULLETS THAT WOULD BE IDEAL EQUIPMENT TO TEMPORARILY STUN THE OPPONENT. SEO PROPOSES A PHASE I STUDY PROGRAM TO DEVELOP A LOW COST/LOW MASS, HIGH ENERGY, PULSED LASER FOR THE SPECIAL OPERATIONS APPLICATIONS. THE DEVICE WILL PROVIDE A LASER BEAM DIVERGENCE CONTROL SO THAT AN INDIVIDUAL IN A GROUP OR THE ENTIRE GROUP OF OPPONENTS CAN BE STUNNED WITH A SINGLE SHOT.

SPARTA INC
23041 AVENIDA DE LA CARLOTA - STE 400
LAGUNA HILLS, CA 92653
Program Manager: DR IRVING OSOFSKY
Contract #:
Title: MECHANICAL BREACHING DEVICE
Topic #: N90-044 Office: MCRDAC ID #: 40877

A MAN PORTABLE, NON-EXPLOSIVE BREACHING DEVICE IS PROPOSED TO GAIN ENTRY INTO BUILDINGS THROUGH WALLS, DOORS, ROOFS, ETC. THE PROPOSED INEXPENSIVE, LIGHTWEIGHT BREACHING DEVICE WILL USE AN INTEGRAL HIGH PERFORMANCE ROCKET MOTOR TO PROVIDE EXTREMELY HIGH FORCES FOR A FEW MILLISECONDS TO DRIVE A RAMMER PLATE OR CUTTING BLADE SET THROUGH THE DESIRED ENTRY POINT. THE COMBINATION OF HIGH FORCE BUT SHORT DURATION IS THE OPTIMUM METHOD OF PENETRATING AND CLEARING THE ENTRY POINT; THE PROPOSED FORCE GENERATOR CAN BE SIZED TO ACHIEVE THE DESIRED RESULTS FOR WIDELY VARYING OBSTACLES. WHILE THE ROCKET MOTOR WILL EMIT AN INTENSE NOISE FOR A FEW MILLISECONDS, THE MOTOR'S SOUND IS UNLIKE THAT OF AN EXPLOSIVE AND WILL SOON BE REPLACED BY THE SOUNDS OF THE ENTRY HOLE DEBRIS. THE ROCKET MOTOR FORCE GENERATOR IS AN ADAPTATION OF A HIGH ACCELERATION ANTI-TANK ROUND BEING DEVELOPED FOR DARPA TO PROVIDE HIGH PROJECTILE VELOCITIES IN VERY SHORT RANGES.

TRIDENT SYSTEMS INC
3554 CHAIN BRIDGE RD
FAIRFAX, VA 22030
Program Manager: DAVID BRITTON
Contract #:
Title: PROTOTYPE COMPUTER AIDED TOOL FOR C3I ARCHITECTURE DESIGN
Topic #: N90-045 Office: SPAWAR ID #: 40878

THE CONTINUING EVOLUTION OF NAVAL WARFARE SYSTEM C3I REQUIREMENTS HAS REMAINED AHEAD OF THE MODELING CAPABILITIES OF THE STANDARD NAVY TOOLS FOR THE PAST SEVERAL GENERATIONS. NAVY SYSTEMS ENGINEERS REQUIRE A TOOL WHICH ALLOWS THEM TO EFFICIENTLY CAPTURE AND ANALYZE CANDIDATE C3I HARDWARE AND SOFTWARE DESIGNS WHICH ARE PROPOSED FOR REAL-TIME FEDERATED AND/OR DISTRIBUTED WARFARE SYSTEMS ARCHITECTURES. THE TOOL SHOULD PROVIDE AN INTEGRATED ENVIRONMENT FOR INTERACTIVITY CAPTURING THE SYSTEM DESIGN (INCLUDING HARDWARE AND SOFTWARE), SIMULATING THE PERFORMANCE OF THE CAPTURED DESIGN AND ALLOW FOR THE

EFFICIENT GENERATION OF ITERATIVE DESIGN MODIFICATIONS AND TESTING. THIS PROJECT WILL ESTABLISH THE DESIGN REQUIREMENTS FOR SUCH A TOOL AND WILL DEVELOP A PROTOTYPE VERSION OF THE TOOL TO DEMONSTRATE PROOF-OF-CONCEPT FOR THE TOOL DESIGN APPROACH AND TO ESTABLISH A FOUNDATION FOR FULL SCALE TOOL DEVELOPMENT.

WAGNER D H ASSOCS INC
27 W QUEENS WY - STE 301
HAMPTON, VA 23669
Program Manager: RICHARD W SAMMS
Contract #:
Title: AN APPLICATION OF THE ANALYTIC HIERARCHY PROCESS TO THE WARFARE SYSTEMS ARCHITECT AND ENGINEER INTEGRATED ASSESSMENT ENVIRONMENT
Topic #: N90-045 Office: SPAWAR ID #: 40879

A NOVEL APPROACH TO ASSESSING THE PERFORMANCE OF COMBINED U.S. NAVAL BATTLE FORCES IS PROPOSED. A MODEL SYSTEM BASED UPON THE ANALYTIC HIERARCHY PROCESS (AHP) AND THE USE OF PAIRWISE COMPARISON MATRICES IS USED TO DETERMINE THE RELATIVE VALUE OF COMPONENTS OF PROJECTING POWER IN THE WARFARE MISSION AREAS. THIS POWER MEASURE COMBINED ESTIMATES OF VULNERABILITY GENERATED IN A SIMILAR FASHION ARE THEN SUGGESTED FOR USE AS THE COEFFICIENTS TO A TIME RATE OF CHANGE MODEL FOR COMPONENT EFFECTIVENESS. THIS PROCESS IS THEN EXTENDED TO A TWO SIDED MODEL.

DONNELL & ASSOCS INC
PO BOX 10161
McLEAN, VA 22102
Program Manager: DR MICHAEL L DONNELL
Contract #:
Title: THE DEVELOPMENT OF INNOVATIVE SYSTEMS ARCHITECTURES
Topic #: N90-049 Office: SPAWAR ID #: 40881

THIS PROPOSAL FOR THE AUTOMATION OF THE WARFARE SYSTEMS ARCHITECTURE DEVELOPMENT PROCESS SEEKS TO DEVELOP AN INNOVATIVE SYSTEM ARCHITECTURE FOR THE EW MISSION AREA AND FOCUSES PRIMARILY ON THE CVBF FORCE STRUCTURE IMPLEMENTATION OF THE EW MISSION AREA. IT WILL FOCUS ON THE EW ARCHITECTURE AS IT IS MOLDED THROUGH THE AUTOMATED APPLICATION OF THE OVERALL ARCHITECTURAL PROCESS. A KNOWLEDGE-BASED SYSTEM CAPABLE OF RULE-BASED INFERENCING AND SUPPORTING OBJECT-ORIENTED PROGRAMMING IS THE KERNEL OF THE SYSTEM. THROUGH THIS SYSTEM IT WILL BE POSSIBLE TO EMBODY AS SYSBOLIC OBJECT STRUCTURES THE FUNCTIONAL AND PHYSICAL ARCHITECTURES REQUIRED IN THE ARCHITECTURAL PROCESS. USING THE RULE-BASED INFERENCING CAPABILITIES OF THE SYSTEM, PHYSICAL ARCHITECTURE PERFORMANCE SHORTFALLS AND OVERLAPS WILL BE IDENTIFIED AND RESOLUTIONS WILL OCCUR. THIS PROCESS MAY DEPEND ONA REPRESENTATION AS OBJECT STRUCTURES OF BOTH 1) THE AVAILABLE AND FEASIBLE TECHNOLOGIES (EMBODIED IN A TECHNOLOGICAL ARCHITECTURE) AND 2) THE CURRENT AND ANTICIPATED ENEMY THREAT (EMBODIED IN A THREAT ARCHITECTURE).

KAPOS ASSOCS INC
1911 N FORT MYER DR - STE 308
ARLINGTON, VA 22209
Program Manager: ERVIN KAPOS
Contract #:
Title: A METHOD FOR QUANTIFYING C2 SUPPORT REQUIREMENTS
Topic #: N90-049 Office: SPAWAR ID #: 40880

PROPOSE TO DEVELOP A NEW METHODOLOGY BY WHICH NAVY C2 SUPPORT SYSTEMS REQUIREMENTS CAN BE PRECISELY DESCRIBED AND QUANTIFIED. THE METHOD WILL USE DATA FROM OPERATIONAL FLOW DIAGRAMS AND SIMILAR SOURCES. IT WILL DESCRIBE OPERATIONAL SEQUENCES AND DERIVATIVE INFORMATION FLOWS AND INFORMATION HANDLING ACTIVITIES. THE METHOD WILL ANALYZE THESE SEQUENCES USING NEWLY DEVELOPED TOOLS THAT WILL INCLUDE AN OPERATIONAL TRANSACTION TAXONOMY, AN INFORMATION LEXICON AND SYNTAX, TRANSLATION PROCEDURES BETWEEN THE TWO, QUANTIFYING PARAMETERS AND QUALITATIVE SPECIFICATIONS, AND A NODAL AND FUNCTIONAL DECOMPOSITION SCHEME. THE RESULT, WHEN APPLIED TO WARFARE AND SUPPORT AREAS (DURING PHASE II), WILL BRIDGE THE CURRENT GAP BETWEEN HIGH-LEVEL, END-TO-END, TLWR-BASED OUTPUT ORIENTED REQUIREMENTS GENERATED BY THE OFD METHODOLOGY, AND THE DETAILED SYSTEM SPECIFICATIONS NEEDED FOR SYSTEM ENGINEERING.

LOGI-TECH ENGINEERING RESOURCES INC
2231 CRYSTAL DR - STE 707
ARLINGTON, VA 22202
Program Manager: ERNEST L MABREY
Contract #:
Title: WARFARE SYSTEMS ARCHITECTURES
Topic #: N90-049 Office: SPAWAR ID #: 40882

A REVISED ARCHITECTURE CONCEPT FOR ASW INFORMATION MANAGEMENT BY REDUCING SHORE-TO-SHIP AND INTER-PLATFORM DATA TRANSMISSION TIME AND BANDWIDTH REQUIREMENTS THROUGH COST EFFECTIVE MANAGEMENT OF INFORMATION IS NOW POSSIBLE. APPLICATION OF THE INFORMATION MANAGEMENT METHODOLOGY TO THE STORAGE, RETRIEVAL, AND TIMELY PRESENTATION OF COHERENT TACTICAL PICTURES WILL BE IMPORTANT BY-PRODUCTS. PROPER INFORMATION MANAGEMENT IS THE KEY. THE FIRST OBJECTIVE IS TO ESTABLISH INFORMATION REQUIREMENTS BY ESTABLISHING A CONCEPT FOR A SET OF TIME-PHASED ARCHITECTURE OPTIONS LEADING TO THE SATISFACTION OF TOP LEVEL WARFARE REQUIREMENTS (TLWR) AS ASW INFORMATION MANAGMENT. THE SECOND OBJECTIVE IS TO CREATE A PLAN THAT WILL PROVIDE FOR THE TRANSITION FROM THE BASELINE ARCHITECTURE TO THE PREFERRED ARCHITECTURE OPTIONS. THIS IS TO BE A REFINEMENT OF A PREVIOUSLY APPROVED AND EXECUTED PHASE 1 PROPOSAL UNDER CONTRACT N00039-89-C-0249 TO ALLOW FOR PHASE II IMPLEMENTATION.

DIGITAL SYSTEMS RESEARCH INC
2000 CLARENDON BLVD - STE 300
ARLINGTON, VA 22201
Program Manager: WILLIE WOODS
Contract #:
Title: INTEGRATED USER SUPPORT FOR SHIPBOARD UNIFORM AUTOMATED DATA PROCESSING RESYSTEMIZATION
Topic #: N90-052 Office: NSSC ID #: 41135

THIS PROJECT WILL DEVELOP METHODS FOR INTEGRATING A TRAINING PROGRAM WITH THE NEWLY RESYSTEMIZED SAUDPS SYSTEM FOR THE PURPOSES OF TRAINING NEWLY REPORTING SAILORS, AND PROVIDING REFRESHER TRAINING TO SAILORS AS THEY MOVE FROM ONE ASSIGNMENT TO ANOTHER ABOARD SHIP. THE PROJECT WILL FURTHER UTILIZE THIS TRAINING AS THE BASIS FOR AN INTEGRATED QUALIFICATION PROGRAM MODELED IN PART UPON STANDARD SHIPBOARD PQS SYSTEMS. FINALLY, THE PROJECT WILL DEVELOP SOFTWARE WHICH WILL UTILIZE AN "EXPERT SYSTEM" TO PROVIDE THE CAPABILITY TO LOCATE REQUIRED REFERENCE MATERIAL. PHASE I OF THIS PROJECT WILL PROVIDE A DETAILED MODEL OF A PROPOSED TRAINING AND QUALIFICATION SYSTEM. CARE WILL BE EXERCISED TO REVIEW SOFTWARE AND HARDWARE OPTIONS TO PROVIDE THE OPTIMAL MIX FOR THIS FUNCTION. IN ADDITION, WE SHALL ENSURE THAT THE GOAL OF TOTAL INTEGRATION INTO THE PLANNED SUADPS SYSTEM IS ATTAINED. A REVIEW OF AVAILABLE ARTIFICIAL INTELLIGENCE BASED SOFTWARE SHALL ALSO

BE PERFORMED. PHASE II OF THE PROJECT WILL PROVIDE A PROTOTYPE OF THE PROPOSED TRAINING, QUALIFICATION, AND REFERENCE LOCATION SYSTEMS.

ANADAC INC
1735 JEFFERSON DAVIS HWY - STE 300
ARLINGTON, VA 22202
Program Manager: DR JOHN J BENNETT
Contract #:
Title: INDEXING OF TECHNICAL INFORMATION FOR COMPUTER AIDED ACQUISITION AND LOGISTICS SUPPORT (CALS)
Topic #: N90-055 Office: NSSC ID #: 41137

PROJECT OBJECTIVES ARE TO MODEL AND ANALYZE CURRENT NAVAL SUPPLY SYSTEM ORGANIZATION AND ITS ASSOCIATED INTERFACES AS IT RELATES TO THE SUPPORTABILITY OF THE WEAPON SYSTEM ACQUISITION PROGRAM AND DOD CALS INITIATIVES. OUTCOME OF PROCESS MODELING WILL INCLUDE IDENTIFICATION OF UNIVERSAL INDEXING SCHEME, PROPOSED INFORMATION SYSTEM ARCHITECTURE AND PROTOTYPE MODEL FOR PURPOSES OF DEMONSTRATION AND VALIDATION OF INDEXING AND DATA STRUCTURE CONCEPTS.

FLIGHT TECHNOLOGY INTERNATIONAL INC
RTE 4 - BOX 324
CHARLOTTESVILLE, VA 22901
Program Manager: M VAN WILSON
Contract #:
Title: DURABLE PRESS FINISH FOR FIRE RETARDANT (FRT) COTTON FABRIC
Topic #: N90-056 Office: NSSC ID #: 41138

THE PROPOSED RESEARCH WILL DETERMINE THE FEASIBILITY OF COMBINING AN ORGANIC PHOSPHORUS COMPOUND SUCH AS IS CURRENTLY IN USE AS A FLAME RETARDANT WITH A NEWLY DEVELOPED DURABLE PRESS COMPOUND THAT HAS SEVERAL ADVANTAGES OVER THE CONVENTIONAL DIMETHYLOLDIHYDROXYETHYLENE UREA (DMDHEU) RESIN COMMONLY USED IN DURABLE PRESS COMPOUNDS. THE NEW COMPOUND HAS NOT, TO OUR KNOWLEDGE, BEEN EVALUATED IN CONJUNCTION WITH FRT TREATMENTS, AND IS THEORETICALLY CHEMICALLY COMPATIBLE. THE RESEARCH WILL ALSO INVESTIGATE THE APPLICATION OF THIS COMPOUND USING A PAD WITH CONTROLLED VACUUM EXTRACTION AS AN ADDITIONAL MEANS OF MAINTAINING THE DESIRABLE QUALITIES OF THE FABRIC. THE PRIMARY ADVANTAGES EXPECTED ARE AN IMPROVED FABRICH HAND, REDUCED LOSS OF TENSILE STRENGTH, AND TOTAL ABSENCE OF FREE FORMALDEHYDE. THE RESEARCH WILL VERIFY COMPATIBILITY, STRENGTH, COLOR FASTNESS WITH COMMONLY USED DYES, AND THE EFFICIENCY OF VARY CATALYSTS. MATERIAL TREATED WITH DMDHEU AND AN ORGANIC PHOSPHORUS FRT COMPOUND WILL BE USED AS A CONTROL SAMPLE DURING THE EXPERIMENTS.

BIOTRONICS TECHNOLOGIES INC
12020 W RIPLEY AVE
WAUWATOSA, WI 53226
Program Manager: KENNETH J SCHLAGER
Contract #:
Title: TRANSCUTANEOUS ANALYTE MEASURING METHODS (TAMM)
Topic #: N90-059 Office: MRDC ID #: 40885

TAMM RELATES TO TWO TECHNOLOGIES FOR NONINVASIVE TRANSCUTANEOUS MEASUREMENTS OF BLOOD ANALYTES THAT HAVE POTENTIAL FOR APPLICATION IN A COMBAT CASUALTY CARE ENVIRONMENT. THE NEAR INFRARED (NIR) REFLECTANCE TECHNOLOGY DETERMINES BLOOD ANALYTE CONCENTRATION BASED

ON DIFFUSE REFLECTANCE MEASUREMENTS WITH A FIBER OPTIC PROBE. SPECTRAL DATA ACQUIRED IS PROCESSED USING SOPHISTICATED PATTERN RECOGNITION TECHNIQUES TO DETERMINE CHEMICAL CONCENTRATION. THE SECOND TECHNOLOGY, REFLECTIVE FLUORESCENCE, USES A SIMILAR FIBER OPTIC PROBLE BUT WITH DIFFERENT INSTRUMENTATION TO MEASURE LUMINESCENCE IN THE EPIDERMIS GENERATED BY PRIMARY OR SECONDARY FLUORESCENCE OF BLOOD ANALYTES. BIOTRONICS' PREVIOUS INSTRUMENTATION DEVELOPMENTS AND CLINICAL EXPERIENCE WILL SUPPORT THE EXPEDITIOUS EVALUATION OF THESE TECHNOLOGIES AND OFFER THE POTENTIAL FOR SUCCESS IN MILITARY FIELD APPLICATIONS. THIS POTENTIAL IS AUGMENTED BY BIOTRONICS' PROVEN RECORD IN THE DEVELOPMENT AND PRODUCTION OF SMALL, RUGGED CLINICAL INSTRUMENTS.

SERIM RESEARCH CORP
PO BOX 4002
ELKHART, IN 46514
Program Manager: DR PAUL R HEMMES
Contract #:
Title: DRY REAGENT TITRATORS FOR THE MEASUREMENT OF BLOOD ANALYTES
Topic #: N90-059 Office: MRDC ID #: 40884

A RAPID AND CONVENIENT TEST FOR BLOOD SERUM ANALYTES IS PROPOSED. THE TEST IS QUANTITATIVE, BUT DOES NOT REQUIRE AN INSTRUMENT. IT IS IDEALLY SUITED FOR ON-SITE USE BY NON-TECHNICAL PERSONNEL. THE TEST DEVICE CONSISTS OF A CHEMICALLY IMPREGNATED PAPER STRIP LAMINATED BETWEEN TWO PLASTIC SHEETS. ONE SHEET IS CLEAR WITH AN OVERPRINTED, GRADUATED SCALE; THE OTHER IS A WHAT OPAQUE PLASTIC WHICH PROVIDES A NEUTRAL BACKGROUND. THE DEVICE IS OPEN AT THE BOTTOM, EXPOSING THE EDGE OF THE REAGENT STRIP, AND VENTED NEAR THE TOP. IN USE, THE BOTTOM EDGE OF THE DEVICE IS EXPOSED TO SAMPLE. AS SAMPLE IS DRAWN THROUGH THE STRIP BY CAPILLARY ACTION, ANALYTE REACTS WITH CHEMICAL REAGENTS IN THE STRIP PRODUCING A VISUAL COLUMN OF COLORED, INSOLUBLE REACTION PRODUCT. THE LENGTH OF THE COLUMN, DETERMINED BY THE GRADUATED SCALE, IS PROPORTIONAL TO ANALYTE CONCENTRATION. A CONVERSION TABLE, CONSTRUCTED BY THE MANUFACTURER FROM STANDARDS, IS USED TO RELATE SCALE UNITS TO CLINICALLY MEANINGFUL CONCENTRATION UNITS.

ADVANCED DIVERSIFIED TECHNOLOGY INC
5965 PACIFIC CENTER BLVD - STE 715
SAN DIEGO, CA 92121
Program Manager: DR CHARLES LIN
Contract #:
Title: COATING SYSTEM FOR HIGH TEMPERATURE TITANIUM ALLOYS
Topic #: N90-060 Office: NASC ID #: 40886

ADVANCE TITANIUM ALLOYS HAVE PROMISING POTENTIAL APPLICATIONS FOR FUTURE GAS TURBINE ENGINES USED IN NAVAL AIRCRAFTS AND MISSILES. HOWEVER, OXIDATION AND HOT SALT-INDUCED STRESS-CORROSION CRACKING, CREEP OR FATIGUE RESULTED IN SIGNIFICANT SURFACE DETERIORATION OF THESE ALLOYS. IN THIS PROPOSED STUDY, WE ATTEMPT TO TEST THE FEASIBILITY OF TWO NEW INORGANIC OXIDE POLYMERS AS PROTECTIVE LAYERS AGAINST THESE HAZARDS. THESE POLYMERS WILL FORM COVALENT BONDS WITH SUBSTRATE SURFACES, AND THE COATINGS ARE NON-PERMEABLE TO CORROSIVE GASES, OXIDATION RESISTANT, HIGH-EROSION AND HIGH TEMPERATURE RESISTANT. IN PHASE I STUDIES, FLAT COUPONS OF ADVANCE TITANIUM ALLOYS WILL BE COATED WITH THESE POLYMERS FOR PRELIMINARY TESTING OF THE FILM PROPERTIES. PHASE II WORK WILL INVOLVE FURTHER CHARACTERIZATION OF THESE COATINGS, VARIOUS MEANS OF SURFACE APPLICATIONS, AND THE POSSIBLE CONFIGURATIVE STRUCTURE OF MULTILAYER, MULTICOMPONENT OR COMPOSITE COATINGS. FINALLY, COATED COMPONENTS WILL BE SUBJECTED TO SIMULATED AND REAL ENVIRONMENTAL TESTINGS. THE SUCCESS OF THIS STUDY WILL PROVIDE SUBSTANTIAL BENEFITS TO DOD AND INFORMATION GENERATED ARE NEEDED BY BOTH CIVIL AND MILITARY SECTORS OF THE FEDERAL GOVERNMENT.

WAUBIK INC
601 W SHARON AVE
HOUGHTON, MI 49931
Program Manager: JAMES A BRUSSO
Contract #:
Title: MODIFIED Al3Ti INTERMETALLIC COATINGS FOR HIGH TEMPERATURE TITANIUM BASE ALLOYS
Topic #: N90-060 Office: NASC ID #: 40887

THE PURPOSE OF THIS RESEARCH PROGRAM IS TO EXPLOIT SOME NEWLY DISCOVERED ALLOY PHASES BASED ON ALLOY-MODIFIED CUBIC Al3Ti AS COATING MATERIALS FOR HIGH TEMPERATURE TITANIUM BASED ALLOYS. THE NEW ALLOYS FORMED BY ADDING CHROMIUM OR MANGANESE TO Al3Ti READILY FORM A DESIRABLE SCALE OF Al2O3 IN OXIDIZING ATMOSPHERES AND HAVE GREATLY IMPROVED MECHANICAL PROPERTIES AND OXIDATION RESISTANCE (AT 2200 DEG F) OVER EARLIER MODIFICATIONS OF Al3Ti. THE PROGRAM WILL USE STATE-OF-THE-ART LOW PRESSURE PLASMA SPRAY TECHNIQUES TO PRODUCE COATINGS ON BOTH CONVENTIONAL AND INTERMETALLIC TITANIUM BASED ALLOYS. POWDERS OF THE COATING ALLOYS TO BE USED IN THE PLASMA SPRAY PROCESS WILL BE PRODUCED BY A STATE-OF-THE-ART ATOMIZATION PROCESS.

PDA ENGINEERING
3754 HAWKINS NE
ALBUQUERQUE, N[illegible] .109
Program Manager: RONALD E ALLRED
Contract #:
Title: EVALUATION OF HEAT DAMAGE IN CARBON/EPOXY COMPOSITES
Topic #: N90-061 Office: NASC ID #: 40888

A SERIES OF WELL CHARACTERIZED IM6/3501-6 COMPOSITE PLATES WILL BE EXPOSED TO CONTROLLED, WILL INSTRUMENTED JP4 POOL FIRES OF VARYING DURATION. FIRE EXPOSED PLATES WILL BE CHARACTERIZED USING PULSE-ECHO ULTRASONIC, MICROSCOPY, DSC, TAG AND MECHANICAL TESTING IN FLEXURE AND SHORT BEAM SHEAR. TEMPERATURE AND HEAT FLUX DATA COMBINED WITH COMPOSITE CHARACTERIZATION RESULTS WILL BE USED TO DETERMINE OPERATIVE DAMAGE MECHANISMS IN HEAT EXPOSED COMPOSITES. THE OBSERVED DAMAGE WILL BE CORRELATED WITH PULSE-ECHO NDI RESULTS TO DETERMINE ITS APPLICABILITY AS A FIELD INSPECTION TECHNIQUE.

TETRA CORP
4905 HAWKINS ST NE
ALBUQUERQUE, NM 87109
Program Manager: WILLIAM M MOENY
Contract #:
Title: AIRBORNE LASER GENERATED LOW FREQUENCY SOUND FOR ASW APPLICATION
Topic #: N90-062 Office: NASC ID #: 40889

THE DETECTION AND LOCALIZATION PHASES OF AIRBORNE ANTISUBMARINE WARFARE (ASW) HAVE, IN THE PAST, RELIED HEAVILY ON PINGER OR EXPLOSIVE ACTIVE ADJUNCTS TO THE PASSIVE SONOBUOYS OR TO ACTIVE SONOBUOYS. BOTH OF THESE REQUIRE EXPENSIVE EXPENDABLES WHICH SEVERLY LIMIT THE DATA RATE. THIS PHASE I PROPOSAL IS TO DETERMINE THE FEASIBILITY OF USING LASER PULSES FROM THE AIRCRAFT TO GENERATE LOW FREQUENCY SOUND FOR SUBMARINE DETECTION AND LOCALIZATION AND FOR OTHER NAVAL APPLICATIONS. PHASE II IS TO DEVELOP THE TECHNOLOGY AND DEMONSTRATE THE CONCEPT. THE OVERALL OBJECTIVE OF THIS PHASE I PROGRAM IS TO DETERMINE THE FEASIBILITY OF GENERATING USEFUL SONAR PULSES IN WATER FROM AIRBORNE LASERS AND THEN TO SCALE THOSE

RESULTS TO AN OPERATIONAL AIRCRAFT SCENARIO TO DETERMINE THE ECONOMIC AND PRACTICAL FEASIBILITY OF THE CONCEPT. SPECIFICALLY, THE FIRST OBJECTIVE IS TO MEASURE THE SOUND AS A FUNCTION OF THE TEMPORAL SHAPE, THE TOTAL ENERGY, THE ENERGY DENSITY (SPOT SIZE), AND THE PULSE LENGTH OF THE PULSE. ANOTHER OBJECTIVE IS TO DETERMINE THE LOW FREQUENCY CONTENT OF THE ACOUSTIC PULSE GENERATED BY THE SPECIAL LASER PULSE TECHNIQUE. A FINAL OBJECTIVE IS TO DEVELOP A CONCEPTUAL DESIGN OF AN AIRBORNE SYSTEM AND ESTIMATE THE SYSTEM COST AND PERFORMANCE.

ATLANTIC AEROSPACE ELECTRONICS CORP
470 TOTTEN POND RD
WALTHAM, MA 02154
Program Manager: DR MICHAEL S WENGROVITZ
Contract #:
Title: ANTI-JAM METHODS FOR RF RECEIVER
Topic #: N90-063 Office: NASC ID #: 41139

DETECTION, LOCALIZATION, AND CLASSIFICATION OF SUBMARINES IN ASW OPERATIONS CAN BE ACCOMPLISHED THROUGH THE USE OF AIR-DROPPED SONOBUOYS. ACOUSTIC SIGNALS SENSED BY SONOBUOYS ARE TELEMETERED BACK VIA AN RF LINK TO AN OVERHEAD AIRCRAFT FOR ASSOCIATED SIGNAL PROCESSING. HOWEVER, THE TELEMETRY PROCESS IS SUBJECT TO RELATIVELY UNSOPHISTICATED RF JAMMING WHICH CAN RENDER THE OVERALL SURVEILLANCE SYSTEM INEFFECTIVE. THIS PROPOSAL IS AIMED AT IMPROVING THE IMMUNITY OF SONOBUOY-BASED ASW SYSTEMS TO RF JAMMING THREATS. THE PROPOSED APPROACH IS TO UTILIZE AN ANTENNA ARRAY AND DIGITL PROCESSOR FOR AUTOMATIC SPATIAL NULLING OF RF JAMMERS. PAST WORK CONDUCTED BY ATLANTIC AEROSPACE IN RAPIDLY-CONVERGENT ADAPTIVE NULLING ALGORITHM DEVELOPMENT, HIGH -RESOLUTION DIRECTION FINDING FOR MULTIPLE CO- CHANNEL EMITTERS, AND REAL-TIME BEAMFORMING/NULLING BRASSBOARD DEVELOPMENT PROVIDES A STRONG FOUNDATION AND RELEVANT BASE FOR THE PROPOSED EFFORT. PHASE I WORK WILL DEFINE CANDIDATE SCENARIOS, QUANTIFY EXPECTED PERFORMANCE GAINS FROM SPATIAL PROCESSING, DEVELOP A JAMMER NULLING ALGORITHM WHICH AVOIDS ERRONEOUS NULLING OF THE DESIRED SIGNALS, AND SPECIFY A HIGH-LEVEL ARCHITECTURE FOR IMPLEMENTATION. THE BASIS OF THE APPROACH IS TO EXPLOIT A SERIES OF WEIGHT-AND-SUM ADAPTIVE BEAMFORMERS WHICH ARE APPLIED TO EACH NARROWBAND SONOBUOY CHANNEL.

PHYSICAL DYNAMICS INC
PO BOX 1883
LA JOLLA, CA 92038
Program Manager: WALTER N PODNEY
Contract #:
Title: SUBSURFACE BUOY FOR NON-ACOUSTIC ASW
Topic #: N90-064 Office: NASC ID #: 40892

POTENTIAL FLOW AROUND A MOVING BODY IN A FLUID PRODUCES DISPLACEMENT OF ISOPYCNAL SURFACES. AT THE FREE SURFACE OF THE FLUID, THE DISPLACEMENT IS KNOWN AS THE "BERNOULLI HUMP". TILT OF THE FREE SURFACE CAN BE MEASURED IN ICE-COVERED SEAS WHERE SURFACE WAVES ARE HEAVILY DAMPLED. THE BERNOULLI HUMP PROCEDURES A TILT SIGNAL IN A FREQUENCY BAND WHERE AMBIENT FLUCTUATIONS ARE SMALL. IN THE OPEN OCEAN, SUBMERGING A TILT PLATFORM ATTENUATES MOTION FROM SURFACE WAVES AND MAY PROVIDE A MEANS TO DETECT SUBMARINES PASSIVELY AND NON-ACOUSTICALLY. MEASUREMENTS PROPOSED FOR PHASE I USE A TEST BUOY TO TELL WHETHER A SIMILAR SPECTRAL WINDOW EXISTS AT DEPTH BELOW AN OPEN SEA. THE TEST ALLOWS ASSESSMENT OF THE FEASIBILITY OF USING SUBSURFACE TILTMETER BUOYS TO TRACK SUBMARINES.

POLATOMIC INC
2201 WATERVIEW PKWY - #1.712
RICHARDSON, TX 75080
Program Manager: ROBERT E SLOCUM
Contract #:
Title: SENSOR FOR AMPLITUDE MODULATED ELECTROMAGNETIC FIELD (AMF) BUOY
Topic #: N90-064 Office: NASC ID #: 40891

A NOVEL HIGH PERFORMANCE DETECTOR OF AMPLITUDE-MODULATED ELECTROMAGNETIC FIELDS (AMF) IS PROPOSED FOR USE IN AIR-DROPPED ASW BUOYS. AN ARRAY OF AMF BUOYS CAN BE USED TO DETECT AND TRACK SUBMERGED SUBMARINES. WE PROPOSE IN PHASE I TO DEFINE THE CONCEPT FOR AN AMF BUOY WHICH UTILIZES A LASER PUMPED ATOMIC OSCILLATOR FOR AMF DETECTION. THE LASER PUMPED ATOMIC OSCILLATOR HAS PROJECTED SENSITIVITY WHICH APPROACHES THAT OF LIQUID HELIUM COOLED SQUID DETECTORS (...) IN THE FREQUENCY BAND FROM DC TO 100kHz. THE KEY TECHNICAL COMPONENT IS A MINIATURE TUNABLE LASER LIGHT SOURCE FOR PUMPING THE ATOMIC OSCILLATOR WHICH IS BEING DEVELOPED BY POLATOMIC, INC. FOR NASA AND NAVSEA. THE ATOMIC OSCILLATOR SENSOR IS A SCALAR SENSOR AND IS EXPECTED TO BE INDEPENDENT OF MOTIONAL EFFECTS WHEN USED TO DETECT AMF SIGNALS IN THE ELF BAND. LOW PRODUCTION COST IN LARGE QUANTITIES WILL BE ACHIEVED THROUGH THE USE OF COMMERCIAL OPTICAL DATA PROCESSING AND COMMUNICATION TECHNIQUES, LASER TECHNOLOGY AND COMPONENTS. IN PHASE I, WE PROPOSE TO DEFINE THE CONCEPT FOR THE AMF BUOY AND SENSOR, PERFORM FEASIBILITY ASSESSMENT AND DEVELOP A CONCEPT DEMONSTRATION PLAN FOR PHASE II.

AMERASIA TECHNOLOGY INC
620-1 HAMPSHIRE RD
WESTLAKE VILLAGE, CA 91361
Program Manager: DR TEONG C LIM
Contract #:
Title: DEVELOPMENT OF LOW PROBABILITY OF INTERCEPT/ANTIJAM (LPI/AJ) MODEM
Topic #: N90-065 Office: NASC ID #: 40893

AN INNOVATIVE LPI/AJ (LOW PROBABILITY OF INTERCEPT/ANTI-JAM) MODEM IS PROPOSED FOR THE SECURED COMMUNICATION LINK BETWEEN U.S. MILITARY AIRCRAFTS. THIS MODEM UTILIZES SPECTRAL SHAPING AND DECEPTION (SSHADE) TECHNIQUE WHICH IS CAPABLE OF PROVIDING COVERT VOICE/DATA COMMUNICATIONS IN A HOSTILE JAMMING ENVIRONMENT. THE PROPOSED TECHNIQUE GIVE 40 dB OF PROCESSING GAIN BY SPREADING THE ENERGY OVER A 40 MHz BANDWIDTH WHEN NARROWBAND (2.4 KBPS) DIGITAL VOICE ENCODING (LPC-10E) IS USED. PRELIMINARY TRADOFF STUDY SHOWS THAT LPC-10E PROVIDES LONGER CODE LENGTH THAN CVSD (CONTINUOUS VARIABLE SLOPE DELTA). THIS MODEM HAS THE POTENTIAL OF PERFORMING IN A -30 dB SIGNAL-TO-NOISE ENVIRONMENT. JAM RESISTANT CAPABILITY IS PROVIDED BY THE AVAILABLE 40 dB PROCESSING GAIN DUE TO SPECTRUM SPREADING. ANOTHER INNOVATION IS THE USE OF SURFACE-ACOUSTIC-WAVE (SAW) CONVOLVER FOR DESPREADING THE RECEIVED SIGNAL WITHOUT THE NEED FOR COMPLEX CODE SYNCHRONIZATION PROCESS.

ELECTRONIC DECISIONS INC
1776 E WASHINGTON ST
URBANA, IL 61801
Program Manager: DR ROBERT J KANSY
Contract #:
Title: ACT LPI/AJ VOICE/DATA LINK
Topic #: N90-065 Office: NASC ID #: 40894

A UNIQUE CONCEPT HAS BEEN DEVELOPED THAT USES THE PERFORMANCE ADVANTAGES OF WIDE BANDWIDTH ACOUSTIC CHARGE TRANSPORT (ACT) DELAY LINES AND TRANSVERSAL FILTERS TO ACHIEVE

LOW PROBABILITY OF INTERCEPT AND JAM RESISTANCE IN A SPREAD SPECTRUM COMMUNICATIONS LINK. RATHER THAN THE USUAL STORED REFERENCE APPROACHES THAT EXHIBIT EITHER LONG ACQUISITION AND SYNCHRONIZATION CYCLES OR LIMITED PROCESSING GAIN AND JAMMING MARGIN, THE APPROACH USES A TRANSMITTED REFERENCE CONFIGURATION IN WHICH THE PROCESSING GAIN IS SET BY THE PRODUCT OF THE TRANSMITTED BANDWIDTH AND THE INTEGRATION TIME. THE PROCESSOR CONFIGURATION FEATURES VIRTUALLY UNLIMITED PROCESSING GAIN POTENTIAL, LOW DETECTABILITY, AND EXCELLENT JAMMING MARGINS TO NOISE AND PULSE SIGNALS. THIS CONFIGURATION HAS NOT BEEN EXPLOITED IN THE PAST PRIMARILY BECAUSE OF ITS PARTICULAR SUSCEPTIBILITY TO CW JAMMING. THE ADVENT OF ACT SIGNAL PROCESSING ALLOWS A HIGH PERFORMANCE ADAPTIVE CW EXCISION CIRCUIT TO BE INCORPORATED IN THE SYNCHRONIZATION PROCESSOR TO ADD THE REQUIRED JAM RESISTANCE. THE GOAL OF THE PROGRAM IS TO ACHIEVE PROCESSING GAIN IN EXCESS OF 30 dB. A BREADBOARD PROCESSOR USING EXISTING ACT SUBSYSTEMS WILL BE CONSTRUCTED AND TESTED TO PROVIDE DATA FOR CONCEPT OPTIMIZATION.

POLYMICRO TECHNOLOGIES INC
3035 N 33RD DR
PHOENIX, AZ 85017
Program Manager: DR DILIP K NATH
Contract #:
Title: OPTICAL FIBER COMPATIBILITY WITH ADVANCED ELECTRONIC/STRUCTURAL MATERIALS
Topic #: N90-066 Office: NASC ID #: 40896

OPTICAL FIBERS CAN BE EMBEDDED IN A COMPOSITE MATERIAL DURING PROCESSING. BY MONITORING THE INTENSITY, POLARIZATION, OR PHASE OF THE LIGHT PASSING THROUGH THE FIBER, LOCAL INFORMATION ON THE STATE OF THE COMPOSITE, I.E., TEMPERATURE, STRAIN, CAN BE OBTAINED. IN ONE CLASS OF IMPORTANT COMPOSITES, BORON OR CARBON FIBER IMPREGNATED WITH PEEK (POLYETHER-ETHER KETONE), THE CURING TEMPERATURE (UNDER PRESSURE) IS APPROXIMATELY 400 DEG C. ONLY THE POLYIMIDES AS A FIBER BUFFER COATING HAVE THE POSSIBILITY OF SURVIVING THIS TEMPERATURE. THE GOAL WILL BE TO EMBED POLYIMIDE COATED OPTICAL FIBERS IN A CARBON FIBER-PEEK COMPOSITE, AND ANALYZE ITS THERMAL AND MECHANICAL HISTORY. SECTIONS OF THE FIBER-COMPOSITE WILL BE TAKEN AND HIGH RESOLUTION SEM (LOW VOLTAGE) IMAGING, CHEMICAL ANALYSIS VIA EDS WILL BE USED TO DETERMINE THE AMOUNT OF THERMAL DEGRADATION THAT OCCURRED AS A CONSEQUENCE OF THE PROCESSING HISTORY. THE EFFECTS ON THE OPTICAL PERFORMANCE OF THE FIBER WILL ALSO BE STUDIED.

SPEC-TRAN CORP
50 HALL RD
STURBRIDGE, MA 01566
Program Manager: DIPAK R BISWAS
Contract #:
Title: OPTICAL FIBER COMPATIBILITY WITH ADVANCED ELECTRONIC/STRUCTURAL MATERIALS
Topic #: N90-066 Office: NASC ID #: 40895

OPTICAL FIBERS CAN PROVIDE AN ADVANCED DATA TRANSMISSION, DIAGNOSTIC AND SENSING CAPABILITY FOR FUTURE AIRCRAFT. THERE IS A NEED TO PROVIDE A MONOLITHIC MATERIALS CAPABILITY FOR DISTRIBUTING FIBER OPTIC SIGNALS IN COMPUTER BACKPLANES AS WELL AS IN AIRCRAFT SKINS AND ENGINE/AIRCRAFT STRUCTURES. WHEN OPTICAL FIBERS ARE EMBEDDED INTO A COMPOSITE MATERIAL, THE FIBER MUST SURVIVE THE TEMPERATURE AND PRESSURE DURING FABRICATION OF THE STRUCTURAL COMPONENTS. WE ARE PROPOSING TO USE A SINGLE-MODE BEND INSENSITVE FIBER WITH A HIGH TEMPERATURE RESISTANT POLYMERIC COATING FOR WITHSTANDING THE TEMPERATURE AND PRESSURE AND FOR TRANSMITTING THE OPTICAL SIGNALS. IN PHASE I, WE WILL EMBED THE ABOVE FIBERS IN A GRAPHITE-EPOXY MATRIX AND WILL DETERMINE THE EFFECT OF TEMPERATURE AND STRAIN ON OPTICAL ATTENUATION OF THE STRUCTURE.

NAVSYS CORP
18725 MONUMENT HILL RD
MONUMENT, CO 80132
Program Manager: ALISON BROWN
Contract #:
Title: LONG DURATION PERFORMANCE OF AIRCRAFT INERTIAL NAVIGATION SYSTEM
Topic #: N90-067 Office: NASC ID #: 40897

A VARIETY OF SENSORS WILL BE INVESTIGATED FOR DAMPING INERTIAL NAVIGATION SYSTEMS THROUGHOUT LONG DURATION MISSIONS. TO PROVIDE MAXIMUM FLEXIBILITY, A KALMAN FILTER DAMPING ALGORITHM WILL BE DEVELOPED SUITABLE FOR ACCURATELY ESTIMATING AND PROPAGATING THE INS ERRORS OVER LONG PERIODS OF TIME. THIS FILTER SHALL BE DESIGNED TO ACCEPT INPUTS FROM A VARIETY OF SENSORS AND SHALL BE CAPABLE OF MODELING DIFFERENT QUALITIES OF INERTIAL NAVIGATION SYSTEMS. THE PERFORMANCE OF THE PROPOSED DAMPED INS SYSTEMS SHALL BE DEMONSTRATED USING THE NAVTEST SIMULATION TOOL DEVELOPED BY NAVSYS. THE RESULTS OF THIS ANALYSIS SHALL BE USED TO PERFORM A COST/BENEFIT TRADE-OFF AND SELECT AN OPTIMUM MECHANIZATION TO BE DEMONSTRATED UNDER PHASE II.

ABACUS PROGRAMMING CORP
14545 VICTORY BLVD
VAN NUYS, CA 91411
Program Manager: DR MALCOLM CURRIE
Contract #:
Title: IMPACT OF USING DISPERSED SENSORS FOR NAVIGATION
Topic #: N90-068 Office: NASC ID #: 40898

THE NAVAL AIR SYSTEMS COMMAND HAS REQUESTED AN INVESTIGATION OF THE SHARING OF THE INERTIAL INSTRUMENTS FROM WITHIN MULTIPLE DISPERSED INERTIAL SYSTEMS. THE SHARING OF REDUNDANT HARDWARE TO PROVIDE FAULT TOLERANCE IS COMMON ON FLIGHT CRITICAL AND LIFE THREATENING AVIONICS APPLICATIONS. THE DIFFERENCE IN THIS INVESTIGATION IS TO EXPLORE THE SHARING OF THE INERTIAL INSTRUMENTS FROM WITHIN MULTIPLE DISPERSED INERTIAL SYSTEMS. ABACUS PROGRAMMING CORPORATION IS PROPOSING TO INVESTIGATE THE DEGRADATION OF NAVIGATION PERFORMANCE IN A DISPERSED INERTIAL NAVIGATION SYSTEM (BEFORE AND) AFTER FAILURE OF NAVIGATION INSTRUMENTS. ABACUS IS PROPOSING A BROAD SYSTEMS ENGINEERING APPROACH TO DIENTIFY THE DRIVING PARAMETERS INVOLVED IN A DISPERSED SENSOR SYSTEM. CONSIDERATION IS MADE NOT ONLY OF THE DISPERSAL OF CONVENTIONAL INS BOXES, BUT THE ABACUS INNOVATIVE APPROACH ALSO INCLUDES THE BROADER QUESTION OF THE ORIENTATION OF DISPERSED/PACKAGED SENSORS TO BALANCE THEORETICAL AND PRACTICAL CONSIDERATIONS TO MINIMIZE THE PERFORMANCE DEGRADATION. THE TYPES OF DEGRADATION CONSIDERED INCLUDE NAVIGATION ACCURACY AND THE SENSITIVITY TO FAILURE DETECTION/CORRECTION AND FALSE ALARMS. THE INVESTIGATION WILL INCLUDE BOTH PLATFORM AND STRAPDOWN INS CONFIGURATIONS. THERE WILL BE INSTANCES WHERE THERE ARE IMPORTANT DIFFERENCES BETWEEN PLATFORM AND STRAPDOWN CONFIGURATIONS.

FORSS
7 S 515 OAK TRAILS DR
NAPERVILLE, IL 60540
Program Manager: R FARHADIEH
Contract #:
Title: PASSIVE FIBER OPTIC COMPONENTS FOR SEVERE ENVIRONMENTS
Topic #: N90-069 Office: NASC ID #: 40900

WE PROPOSE TO DEVELOP A MULTI-CHANNEL FIBER OPTIC INTERCONNECTION DEVICE THAT CAN WITHSTAND THE SEVERE CONDITIONS OF THE MILITARY AIRCRAFT ENVIRONMENT. THE PROPOSED INTERCONNECT DEVICE CONSISTS OF AN ADAPTER AND A CONNECTOR FOR RIBBON FIBERS OR MULTI-CHANNEL CABLES. THIS DEVELOPMENTAL ACTIVITY WILL FOCUS ON ADVANCED TECHNOLOGIES AND ADVANCED ENGINEERING MATERIALS. SPECIFICALLY, WE INTEND TO USE ETCHED SILICON CHIPS, THAT CAN BE FABRICATED WITH EXTREMELY TIGHT TOLERANCES, TO POSITION THE OPTICAL FIBERS. WE INTEND TO EXTEND THE "FLOATING CONTACT" CONCEPT TO A MULTI-CHANNEL CONNECTOR. IN ADDITION, ADVANCED POLYMERIC COMPOSITE MATERIALS THAT HAVE EXCELLENT HIGH TEMPERATURE CAPABILITIES, SUCH AS FILLED LIQUID CRYSTAL POLYMERS, WILL BE USED. FINALLY, NOVEL BONDING TECHNIQUES THAT CAN WITHSTAND HIGH TEMPERATURES AND HIGH VIBRATION WILL BE INVESTIGATED. THESE ADVANCED ELEMENTS WILL GENERATE A NEW CLASS OF FIBER OPTIC CONNECTORS. SMALLER MULTI-CHANNEL FO CONNECTORS WILL BE DESIGNED BY USING TIGHTER FIBER PLACEMENT IN THE ETCHED SILICON V-GROOVES. LIGHTER CONNECTORS WILL RESULT FROM SIZE REDUCTION AND FROM ADVANCED COMPOSITE MATERIALS. METAL REDUCTION WILL REDUCE RADAR CROSS- SECTIONS. THE "FLOATING CONTACT" CONCEPT WILL PROVIDE: REDUCTION OF INSERTION LOSS TO BELOW 1 dB, IMPROVED TEMPERATURE CAPABILITY, AND IMPROVED TOLERANCE OF HIGH VIBRATION ENVIRONMENTS.

GRADIENT LENS CORP
207 TREMONT ST
ROCHESTER, NY 14608
Program Manager: C BENJAMIN WOOLEY
Contract #:
Title: SOL-GEL GRIM FIBER OPTIC CONNECTORS
Topic #: N90-069 Office: NASC ID #: 40899

THE PRIMARY TECHNICAL OBJECTIVE OF THIS RESEARCH IS TO DESIGN FIBER OPTIC CONNECTORS WHICH INCORPORATE SOL-GEL MADE GRIN LENSES WHICH CAN WITHSTAND THE HIGH TEMPERATURE AND VIBRATION WHICH IS PRESENT IN A MILITARY AIRCRAFT ENGINE. THE SECONDARY OBJECTIVE WILL BE TO IDENTIFY THOSE SOL-GEL SYSTEMS WHICH SHOW THE BEST RESISTANCE TO DAMAGE DUE TO HEATING FOR INCORPORATION INTO THE FIBER OPTIC CONNECTORS REQUIRED TO OPERATE IN SEVERE ENVIRONMENTS.

OPTECH LAB
22048 SHERMAN WY - #107
CANOGA PARK, CA 91303
Program Manager: DR SHI-KAY YAO
Contract #:
Title: PROGRAMMABLE THREAT WARNING RECEIVER
Topic #: N90-072 Office: NASC ID #: 40901

A MULTI-CHANNEL ACOUSTO-OPTIC CORRELATOR IS PROPOSED AS PROGRAMABLE RADAR SIGNAL DETECTOR FOR THREAT WARNING. THE SYSTEM IS EXPECTED TO DETECT PN SEQUENCE WAVEFORMS, FM, FM ON PULSES, AND CONVENTIONAL PULSES. HIGH SENSITIVITY IS POSSIBLE WITH SPECIAL TREATMENT OF SYNCHRONIZED NOISES IN THE CORRELATOR. FOR CONVENTIONAL PULSES, THE SYSTEM REDUCES TO A CHANNELIZED RECEIVER. THE PHASE I PROGRAM WILL ANALYZE THE PERFORMANCE AND DESIGN ISSUES WITH THE MULTI-CHANNEL CORRELATOR. A BREADBOARD DESIGN AND PROGRAM PLAN WILL BE DEVELOPED FOR THE PHASE II PROGRAM.

AERODYNE RESEARCH INC
45 MANNING RD
BILLERICA, MA 01821

Program Manager: MALCOLM A LeCOMPTE
Contract #:
Title: PASSIVE NON-COOPERATIVE TARGET RECOGNITION SENSOR
Topic #: N90-073 Office: NASC ID #: 40902

THE POLARIZATION CHARACTERISTICS OF AIRCRAFT INFRARED SIGNATURES HAVE BEEN STUDIED AS A MEANS TO ENHANCE THE PERFORMANCE OF LONG RANGE PASSIVE INFRARED DETECTION SYSTEMS OPERATING IN THE PRESENCE OF CLUTTER. THESE STUDIES ALSO GENERATED EVIDENCE THAT THE AMOUNT AND ANGLE OF POLARIZATION AS WELL AS ITS SPATIAL DISTRIBUTION ARE UNIQUE BETWEEN DIFFERENT TYPES AND CLASSES OF AIRCRAFT. IT MAY BE POSSIBLE TO DETERMINE AN AIRCRAFT'S SIGNATURE POLARIZATION CHARACTERISTICS ACCURATELY ENOUGH TO USE THEM FOR LONG RANGE PASSIVE IDENTIFICATION. A PRELIMINARY ASSESSMENT OF THE FEASIBILITY OF THIS TECHNIQUE WAS PERFORMED BY AERODYNE RESEARCH, INC. THIS WORK WAS SUPPORTED BY HONEYWELL SYSTEMS RESEARCH CENTER, MINNEAPOLIS AS PART OF THE AIR FORCE/WRIGHT RESEARCH AND DEVELOPMENT CENTER SPONSORED MULTI-ATTRIBUTE IDENTIFICATION AND ANALYSIS (MAIDA) PROGRAM. THE CALCULATIONS WERE MADE WITH AERODYNE'S IR SIGNATURE POLARIZATION FOR TWO AIRCRAFT OF DIFFERENT SIZE AND SHAPE, AT THE SAME RANGE, ASPECT AND FLIGHT CONDITION. THE CALCULATIONS WERE MADE WITH AERODYNE'S IR SIGNATURE POLARIZATION MODEL: "POLAR". OUR ANALYSIS OF THIS PRELIMINARY STUDY INDICATES THAT THERE ARE DIFFERENCES IN AIRCRAFT SIGNATURE POLARIZATION WHICH MAY BE EXPLOITED FOR TARGET IDENTIFICATION. HOWEVER, THE STUDY WAS LIMITED IN SCOPE AND ITS RESULTS CANNOT BE REGARDED AS CONCLUSIVE AERODYNE PROPOSES TO CARRY OUT A MORE EXTENSIVE STUDY OF AIRCRAFT SIGNATURE POLARIZATION TO DETERMINE WHETHER THERE IS SUFFICIENT VARIABILITY TO MAKE IT FEASIBLE FOR USE IN PASSIVE TARGET RECOGNITION.

SCIENCE & APPLIED TECHNOLOGY INC
8380 MIRAMAR MALL STE 201
SAN DIEGO, CA 92121
Program Manager: C F BUMAN/K SHERMAN
Contract #:
Title: SECONDARY SENSOR FOR ANTI-RADIATION MISSILES
Topic #: N90-074 Office: NASC ID #: 40903

THIS PROGRAM PROVIDES AN INNOVATIVE APPROACH OF MILLIMETER WAVE (MMW) UTILIZING THE MOST ADVANCED ACTIVE END GAME HOMING SENSOR IN AN AUGMENTATED SHARED APERTURE MODE WITH ANTI-RADIATION HOUSING WEAPON SYSTEMS. THIS DUAL MODE SENSOR SYSTEM APPROACH WILL BE ABLE TO PENETRATE THE COUNTERMEASURE TECHNIQUE SUCH AS RADIATION SOURCE SHUT DOWN NEAR THE TARGET AREA. THE ACTIVE MMW TERMINAL SENSOR EMPLOYS A COMMON APERTURE TWO PLANE LINEAR ANTENNA ARRAY FOR BOTH TRANSMITTING AND RECEIVING. THE MMW ANTENNA ARRAY IS CO-LOCATED WITH ARH SPIRALS, MOUNTED IN AN X CONFIGURATION BETWEEN SPIRALS, AND IS COMPATIBLE WITH EITHER GIMBALED OR FIXED BODY CONFIGURATION. THE ARRAY PROVIDES A WIDE ACQUISITION FIELD FOR ARH HAND-OVER AND GENERATES DIRECTIONAL GAIN WHICH RESULTS IN HIGH ACCURACY AND MODERATE ACQUISITION RANGES. THE MMW PROCESSOR UTILIZES TARGET RECOGNITION ALGORITHMS FOR CORRELATION PURPOSES AND TERMINAL ACCURACY ENHANCEMENT.

ELECTRO-OPTEK CORP
3152 KASHIWA ST
TORRANCE, CA 90505
Program Manager: C F HUANG
Contract #:
Title: MULTICOLOR SENSORS FOR IMPROVED AIRBORNE INFRARED SEARCH AND TRACKING
Topic #: N90-075 Office: NASC ID #: 40904

A NEED EXISTS FOR AN INFRARED (IR) IMAGING SPECTROMETER THAT MEASURES SIMULTANEOUSLY SPATIAL AS WELL AS SPECTRAL DISTRIBUTIONS OF IR TARGETS, FOR TARGET RECOGNITION AND DISCRIMINATION AGAINST CLUTTER OR DECOYS. RECENT ADVANCES IN SEMICONDUCTOR BANDGAP ENGINEERING BY MOLECULAR BEAM EPITAXY (MBE) HAVE PRODUCED QUANTUM- WELL DETECTORS IN THE FORM OF SUPERLATTICES (SLs) WITH VERY NARROW SPECTRAL BANDS IN THE INFRARED. THE SL DETECTORS CAN BE USED TO CONSTRUCT AN IMAGING SPECTROMETER WITH HIGH SPATIAL AND SPECTRAL RESOLUTION THAT CAN MEET THIS NEED. THIS PROPOSAL IS TO DEVELOP A VERTICAL STACK OF THESE SLs, EACH RESPONDING TO AN UNIQUE NARROW BAND, USING THE MBE GROWTH OF SLs OF AlGaAs/GaAs. BY ALTERING THE PERIODICITY OF THE SLs THE INFRARED BANDS WILL BE CHANGED SO THAT THE QUANTUM-WELL DETECTORS FORMING AN IR SPECTROMETER WILL RESPOND TO THE BANDS SIMULTANEOUSLY. AN ARRAY OF THESE SL STACKS WILL BE USED TO FORM THE FINAL IMAGING SPECTROMETER EITHER IN THE STARING OR SCANNING MODE. SPECIAL EFFUSION SOURCES, MBE EPITAXIAL GROWTH PROCESSES AND FEW TRAIL EPITAXY GROWTH RUNS WILL BE DESIGNED, DELINEATED AND MADE, RESPECTIVELY, IN PHASE I FOR THE SPECTROMETER DEVELOPMENT. PHASE II WILL BE DEVOTED TO THE FABRICATION OF THE SL SPECTROMETER, WHILE PHASE III WILL BE DEDICATED TO CONSTRUCTING THE IMAGING SPECTROMETER, SPECIFICALLY FOR AIRBORNE SEARCH AND TRACK APPLICATION.

HORIZONS TECHNOLOGY INC
3990 RUFFIN RD
SAN DIEGO, CA 92123
Program Manager: DR WILLIAM T KREISS
Contract #:
Title: SENSOR APPLICATION IN ANTI-AIR WARFARE
Topic #: N90-076 Office: NASC ID #: 40905

THIS RESEARCH PROGRAM WILL INVESTIGATE THE PERFORMANCE OF NEW- TECHNOLOGY EO-IR ANTI-AIR WARFARE SENSOR SYSTEMS IN NOISY, CLUTTERED, AND OBSCURED ENVIRONMENTS. THIS PHASE I EFFORT WILL CHARACTERIZE SENSOR SYSTEMS AND OPERATIONAL ENVIRONMENTS, AND WILL IDENTIFY THE ALGORITHMS THAT HAVE BEEN, AND ARE CURRENTLY BEING, USED TO PROCESS SENSOR SYSTEM OUTPUTS TO MODERATE THE DETRIMENTAL IMPACTS OF ATMOSPHERIC TURBIDITY AND COUNTERMEASURES. THIS STUDY WILL TREAT THE EFFECTS OF ATMOSPHERIC PROCESSES AND CONDITIONS, AND OF COUNTERMEASURES, ON LIMITATIONS TO ANGULAR DISCRIMINATION, SCANNING MODES, TARGET-DETECTOR RANGE, NOISE, AND DETECTOR SENSITIVITY. A RANKED IDENTIFICATION OF CRITICAL LIMITATIONS TO PERFORMANCE AS FUNCTIONS OF SENSOR SYSTEM PARAMETERS, E.G., NUMBER OF SENSOR ELEMENTS, SENSOR ELEMENT ARRAY CONFIGURATIONS, SCANNING MODES, OPTICS AND FOCAL PLANES, NEP, D*, ETC., WILL BE GENERATED, AND THEN ALL IDENTIFIED SIGNAL PROCESSING ALGORITHMS DESIGNED TO OPTIMIZE TARGET DETECTION AND RECOGNITION WILL BE MATCHED TO THIS MATRIX. ANALYSIS OF THIS MATRIX WILL IDENTIFY DEFICIENCIES IN EXISTING ALGORITHMS AND DEFINE THE REQUIREMENTS FOR IMPROVED ALGORITHMS. A PRELIMINARY ASSESSMENT OF THE GAINS TO BE EXPECTED FROM THE NEW GENERATION EO-IR SENSOR SYSTEMS UNDER NON-IDEAL CONDITIONS WILL BE PROVIDED ALONG WITH A PHASE II WORK FOR HARDWARE AND SOFTWARE ALGORITHM APPLICATION. THE UTILITY OF AN HTI-DEVELOPED END-TO-END AERIAL TARGETING WORKSTATION FOR PHASE II EVALUATION OF SIGNAL PROCESSING ALGORITHMS FOR CLUTTERED AND OBSECURED ENVIRONMENTS WILL BE DEMONSTRATED.

CSA ENGINEERING INC
560 SAN ANTONIO RD - STE 101
PALO ALTO, CA 94306
Program Manager: JOSEPH R MALY
Contract #:
Title: DESIGN OF VIBRATION DAMPING DEVICES FOR AIRCRAFT AERODYNAMIC SURFACES
Topic #: N90-077 Office: NASC ID #: 40906

VIBRATIONS ARE AN INHERENT PROBLEM FOR AIRCRAFT STRUCTURES, ESPECIALLY MILITARY AIRCRAFT THAT PERFORM HIGH-SPEED MANEUVERS CAUSING EXTREME ACCELERATION LEVELS. A FORM OF UNWANTED VIBRATION REFERRED TO AS BUFFET OFTEN OCCURS WHEN A SURFACE OF AN AIRCRAFT IS DIRECTLY EXPOSED TO AN UNSTEADY, VORTEX FLOW GENERATED UPSTREAM DURING HIGH-ANGLE-OF-ATTACK MANEUVERS. IN THE CASE OF CERTAIN FIGHTER AIRCRAFT, FOR EXAMPLE, BUFFETING OF THE TWIN VERTICAL STABILIZERS EXCITES THE BENDING AND TORSIONAL MODES OF THESE STRUCTURES, AND, OVER TIME, FATIGUE FAILURES OCCUR. AIRCRAFT DESIGN IS CONTROLLED BY MANY FACTORS, AND USUALLY VIBRATION PROBLEMS HAVE TO BE SOLVED WITHOUT MAJOR DESIGN MODIFICATIONS; VIBRATION DAMPING IS OFTEN A PREFERRED SOLUTION ESPECIALLY WHEN THE SOURCE OF THE EXCITATION CANNOT BE ELIMINATED. DESIGN CONSIDERATIONS FOR THE DEVELOPMENT OF DAMPING TREATMENTS INDICATE THAT TUNED-MASS DAMPERS ARE MORE FEASIBLE FOR AIRCRAFT AERODYNAMIC SURFACE VIBRATION PROBLEMS THAN OTHER TYPES OF DAMPERS. THIS IS ESPECIALLY TRUE FOR MODIFICATIONS TO EXISTING AIRCRAFT. DAMPING TECHNOLOGY HAS ADVANCED DRAMATICALLY IN RECENT YEARS, AND THE APPLICATION OF PASSIVE DAMPING TECHNOLOGY HAS PRODUCED IMPRESSIVE RESULTS FOR A WIDE RANGE OF STRUCTURES. INCORPORATING DAMPING INTO AIRFOIL STRUCTURES IS A NATURAL PROGRESSION THAT COULD SOLVE CURRENT PROBLEMS AND LEAD TO IMPROVED DESIGNS IN THE FUTURE.

WAGNER D H ASSOCS INC
27 W QUEENS WY - STE 301
HAMPTON, VA 23669
Program Manager: DR DOUGLAS S HULBERT
Contract #:
Title: OPERATIONAL EXPLOITATION OF ACTIVE AND PASSIVE SENSOR INFORMATION BY USN TACTICAL AIRCRAFT OPERATING IN A MULTI-PLATFORM...
Topic #: N90-078 Office: NASC ID #: 40907

ALGORITHMS FOR FUSING AND DISPLAY OF ACTIVE AND PASSIVE SENSOR INFORMATION IN THE AIRBORNE TACTICAL ENVIRONMENT ARE OUTLINES. FUSION AND DISPLAY IS PARTITIONED INTO TRACK EXTRAPOLATION, OBSERVATION UPDATE, CORRELATION, GRIDLOCK, ERROR MANAGMENT, AND USER INTERACTION. METHODS OF TESTING THE TOTAL PROCESS WITH SENSOR DATA SIMULATION, CONFLICT SIMULATION, AND MEASURES OF EFFECTIVENESS ARE DISCUSSED.

CHEMICAL & ENVIRONMENTAL SERVICES INC
3200 WEST END AVE - STE 405
NASHVILLE, TN 37203
Program Manager: DR WILLIAM F BRANDES
Contract #:
Title: MINIMIZATION OF ENVIRONMENTAL AND HEALTH HAZARDS THROUGH THE USE OF INNOVATIVE MATERIALS AND MAINTENANCE PROCESSES
Topic #: N90-080 Office: NASC ID #: 40908

AIRCRAFT MAINTENANCE PRACTICES USE A NUMBER OF HAZARDOUS MATERIALS. HAZARDOUS MATERIALS MANAGEMENT PRACTICES CONSIST OF A RANGE OF ALTERNATIVES INCLUDING THE INSTITUTION OF NEW PROCESS, MODIFICATION OF EXISTING PROCESSES, AND MATERIALS SUBSTITUTION. TO MEET INCREASINGLY STRINGENT EPA REQUIREMENTS, IT IS NECESSARY TO CONTINUALLY IMPROVE MAINTENANCE PRACTICES WITH UPDATED TECHNOLOGY THROUGH TECHNOLOGY TRANSFER AND NECESSARY RESEARCH. PHASE I OBJECTIVES INCLUDE THE EVALUATION OF EXISTING TECHNOLOGIES TO DETERMINE THE NAVY'S ABILITY TO COMPLY WITH PRESENT AND ANTICIPATED ENVIRONMENTAL REGULATIONS. CURRENT LEGISLATIVE INITIATIVES WILL BE IDENTIFIED AND APPROPRIATE LEGISLATIVE AND REGULATORY OFFICES WILL BE CONTACTED AND SURVEYED FOR EXPECTED ADDITIONS AND CHANGES TO ENVIRONMENTAL PROTECTION PROGRAMS. CURRENT NAVY PRACTICES WILL BE DETERMINED BY VISITING THE NARF SITES AND OTHER APPROPRIATE NAVY FACILITIES AND REVIEWING

EXISTING NAVY INFORMATION WITH REGARD TO CURRENT PRACTICES. SUBSEQUENT EVALUATION WILL BE MADE BASED ON THE ABOVE ACTIVITIES TO DETERMINE THE NAVY'S ABILITY TO MEET EPA LAWS THROUGH THE YEAR 2000. THE GOAL IS TO IDENTIFY THOSE AREAS WHICH MIGHT REQUIRE RESEARCH THRUSTS TO KEEP THE NAVY IN COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS, FORMING THE BASIS FOR THE PHASE II RESEARCH ACTIVITIES.

XMCO INC
460 SPRING PARK PL - STE 1500
HERNDON, VA 22070
Program Manager: JOHN E RITCHIE JR
Contract #:
Title: AUTOMATED RCM/LSAR DATA INTEGRATION CAPABILITY
Topic #: N90-083 Office: NASC ID #: 40909

XMCO INC, WITH THE SUPPORT OF THE RAIL COMPANY, PROPOSES A PHASE I FEASIBILITY STUDY TO DEVELOP A COMPUTER PROGRAM LIKE INTEGRATING NAVAIR AUTOMATED RCM WORKSHEET DATA WITH THE MIL-STD-1388-2A AUTOMATED LOGISTIC SUPPORT ANALYSIS RECORD. STUDY ISSUES TO BE RESOLVED INCLUDE DATA ELEMENT COMPATABILITY BETWEEN AUTOMATED SYSTEM, SUFFICIENCY OF DATA TO SUPPORT REQUIRED ANALYSES, COMMONALITY OF SYSTEM HARDWARE INDENTURE STRUCTURE CODING BETWEEN AUTOMATED DATA SYSTEMS, AND IMPACT OF ONGOING TRISERVICE RCM STANDARDIZATION, MIL-STED-1388-2B, AND CALS. THE STUDY IS APPROACHED THROUGH SIX TASKS THAT WILL: (1) FURTHER DEVELOP COMPUTER LINK FUNCTIONAL REQUIREMENTS; (2) CONDUCT AN INITIAL INVESTIGATION; (3) PRESENT INVESTIGATION RESULTS; (4) DEFINE COMPUTER LINK PERFORMANCE OBJECTIVES; (5) PERFORM A FEASIBILITY ANALYSIS; AND (6) PROVIDE A BRIEFING AND A FINAL REPORT. PHASE I STUDY RESULTS WILL DETERMINE THE FEASIBILITY OF DEVELOPING THE COMPUTER PROGRAM LINK. SUCCESSFUL COMPLETION OF THE STUDY WILL IDENTIFY THE FEASIBLE BEST-CANDIDATE SYSTEM FOR WHICH A PERFORMANCE SPECIFICATION WILL BE PREPARED AND INCLUDED IN THE FINAL REPORT AS A FOUNDATION FOR THE SYSTEM DESIGN AND DEVELOPMENT EFFORT IN PHASE II.

KETRON INC
350 TECHNOLOGY DR
MALVERN, PA 19355
Program Manager: DAVID A ROE
Contract #:
Title: AUTOMATED INTEGRATION OF LEVEL OF REPAIR ANALYSIS (LORA) WITH LOGISTICS SUPPORT ANALYSIS RECORD (LSAR)
Topic #: N90-084 Office: NASC ID #: 40910

SUCCESSFUL DEVELOPMENT OF AN AUTOMATED DATA INTEGRATION LINK BETWEEN LSAR AND LORA DATA BASES CAN REDUCE REDUNDANT LABOR INTENSIVE MANUAL OPERATIONS CURRENTLY REQUIRED TO MAINTAIN THE INDEPENDENT DATA BASES. BECAUSE ENGINEERING AND PROGRAM DATA BECOME MORE CLEARLY DEFINED AS HARDWARE DEVELOPMENT PROGRESSES, DATA BASES MUST BE CONTINUALLY UPDATED. BECAUSE THE DATA BASES ARE PRESENTLY INDEPENDENT, AN AUTOMATED INTEGRATION LINK WOULD REDUCE LABOR INTENSIVE LOR DATA SET DEFINITIONS AND DATA BASE MAINTENANCE TASKS, INCREASE CONSISTENCY BETWEEN FILES, ALLOW FOR MORE RAPID GENERATION OF REPORTS, AND STREAMLINE THE MAINTENANCE PLANNING PROCESS. AT THE CORE OF OUR APPROACH IS THE REALIZATION THAT, INITIALLY, DATA MIGHT FLOW FROM LOR ANALYSES PERFORMED DURING THE CONCEPTUAL AND DESIGN PHASES OF DEVELOPMENT TO NEW LSAR DATA BASES, AND THEN LATER, FLOW FROM UPDATED AND MORE RIGOROUSLY CONTROLLED LSAR DATA BASES TO LOR FILES. SIGNIFICANTY, WE PROPOSE A FLEXIBLE, USER-CONTROLLED "FLOW SWITCH" DATA LINK CONCEPT WHEREBY THE DIRECTION OF DATA FLOW AND USER-DEFINED TYPES AND CATEGORIES OF DATA CAN BE SPECIFIED, IN ORDER TO COMPLY IN THE GREATEST WAY POSSIBLE WITH THE DESIRES OF THE ANALYST. FINALLY, THE

LINK WILL BE DESIGNED IN CONSIDERATION OF THE CALS INITIATIVE IN ORDER TO BE ABLE TO ACCESS ANY NEWLY CREATED DATA BASES, SUCH AS MANUFACTURER'S PART NO./WUC CROSS-REFERENCE WHICH ARE NOT NOW EXISTANT.

LOGIS-TECH
1800 DIAGONAL RD - STE 250
ALEXANDRIA, VA 22314
Program Manager: CHARLES S GREEN
Contract #:
Title: AIRCRAFT AND ENGINE PRESERVATION DEVELOPING OF STATE-OF-THE-ART NAVY PROGRAM
Topic #: N90-085 Office: NASC ID #: 40911

RECOGNIZING THAT CORROSION REDUCES PRODUCTIVITY AND EQUIPMENT AVAILABILITY AND ULTIMATELY COSTS $2-4 BILLION ANNUALLY, THE NAVY SEEKS A "PRO-ACTIVE," COMPREHENSIVE AIRCRAFT AND ENGINE PRESERVATION PROGRAM. SIGNIFICANT ADVANCES IN PRESERVATION TECHNOLOGY ARE OCCURRING - NAVY PRESERVATION TECHNIQUES NEED UPGRADING. THIS PROJECT WILL PROVIDE THE BASIS FOR A SOUND, STATE-OF-THE-ART AVIATION AND ENGINE PRESERVATION PROGRAM. IT WILL IDENTIFY THE TECHNOLOGIES, EQUIPMENT AND PRACTICES TO SATISFY CURRENT AND FUTURE PRESERVATION REQUIREMENTS IN AN EFFICIENT AND EFFECTIVE MANNER. BACKGROUND INFORMATION, PRESERVATION ENVIRONMENT REQUIREMENTS, COMPARATIVE PROGRAMS, STATE-OF-THE-ART TECHNIQUES AND EQUIPMENT, PROGRAMMATIC DATA AND RECOMMENDATIONS WILL FORM THE BASIS FOR A COMPREHENSIVE PROGRAM TO MEET EVOLVING NAVY REQUIREMENTS. THIS PROJECT WILL DEVELOP THE KNOWLEDGE AND DATA ESSENTIAL FOR COST-EFFECTIVE AND EFFICIENT APPROACHES TO NAVY PRESERVATION REQUIREMENTS. THE PROJECT WILL FURTHER OUTLINE A PROGRAM THAT ADDRESSES THE PRESERVATION CONSIDERATIONS THAT MUST BE ACCOMMODATED AND PRESENT A ROAD MAP FOR NAVY AIRCRAFT AND ENGINE PRESERVATION PROGRAM DEVELOPMENT.

INTELLIGENT AUTOMATION INC
1370 PICCARD DR
ROCKVILLE, MD 20850
Program Manager: DR JACQUELINE HAYNES
Contract #:
Title: SMACK: SMART MANUAL CONVERSION KIT
Topic #: N90-086 Office: NASC ID #: 40912

THE PURPOSE OF THE PROJECT IS TO DEVELOP AN ARCHITECTURE AND PROTOTYPE FOR A COMPUTER-BASED TOOL THAT WILL AUTOMATE THE CONVERSION OF PAPER DOCUMENTS (TECHNICAL MANUALS, INCLUDING BOTH TEXT AND GRAPHICS) INTO A FORMAT THAT IS SUITABLE FOR INTERACTIVE ELECTRONIC DISPLAY. OUR PROPOSED FORMAT WILL ALSO INCLUDE A SET OF TOOLS THAT WILL AUTOMATICALLY OPTIMIZE THE ELECTRONIC PRESENTATION OF THE TECHNICAL MANUALS FOR THE INDIVIDUAL READER OF THE DOCUMENT. THE PROPOSED SYSTEM, WHICH WE CALL SMACK (SMART MANUAL CONVERSION KIT) WILL INCLUDE INTELLIGENT SCANNING CAPABILITIES, SEVERAL TEMPLATES FOR AN INTELLIGENT DECOMPOSITION OF TECHNICAL DOCUMENTS INTO A FRAME-BASED PRESENTATION APPROPRIATE FOR THE SPECIFIC TEXT, AND AN INTELLIGENT TUTORING COMPONENT, WHICH WILL INCLUDE SEVERAL PRESENTATION FORMATS THAT CAN BE SELECTED AND MODIFIED TO OPTIMIZE THE PRESENTATION OF A GIVEN DOCUMENT TO A GIVEN READER. THE PROPOSED SYSTEM WOULD BE DEVELOPED INCREMENTALLY, WITH INCREASINGLY LESS HUMAN INTERVENTION REQUIRED IN THE PROCESS. CAREFUL CONSIDERATION WILL BE GIVEN TO INTEGRATION OF SMACK WITH THE RELEVANT COMPONENTS OF DoD'S CALS PROGRAM.

NORTH STAR TECHNOLOGY INC

PO BOX 482 - C'''RCH ST
LIMESTONE, ME 04750
Program Manager: PAUL R YOUNG
Contract #:
Title: AUTOMATED TECHNOLOGY FOR CONVERSION OF EXISTING PAPER TECHNICAL MANUALS INTO A FORM SUITABLE FOR INTERACTIVE ELECTRONIC DISPLAY
Topic #: N90-086 Office: NASC ID #: 40913

THIS WORK WILL EXAMINE THE APPLICABILITY OF EXPERT SYSTEM TECHNOLOGY TO THE PROBLEM OF CONVERTING EXISTING PAPER-BASED TECHNICAL DOCUMENTATION TO DIGITAL FORMAT. THE MAJOR FOCAL POINTS OF THE WORK WILL INCLUDE CONSIDERATION OF THE KNOWLEDGE NECESSARY TO (1) DECOMPOSE THE TEXT INPUT INTO CATEGORIES APPROPRIATE TO THE TARGET DIGITAL FORMAT, AND (2) CORRELATE RELATED SECTIONS OF THE INPUT SO THAT THEY MAY BE CROSS-REFERENCED. THE PRODUCT OF THE EFFORT WILL BE A DESIGN DOCUMENT AS WELL AS A LIMITED DEMONSTRATION PROTOTYPE.

PWR INC
1750 KALAKAUA AVE - STE 3570
HONOLULU, HI 96826
Program Manager: DAVID T PLIMIER
Contract #:
Title: EFFICIENT AUTOMATION OF EXISTING NAVY TI
Topic #: N90-086 Office: NASC ID #: 40914

OUR PROPOSAL HAS THREE MAJOR GOALS: 1) ELIMINATE IMPEDIMENTS TO ECONOMICAL CONVERSION OF EXISTING NAVY TI, 2) PROVIDE EFFECTIVE DELIVERY OF EXISTING NAVY TI TO ELECTRONIC DISPLAYS INCLUDING SMALL FIELD DISPLAY DEVICES, AND 3) STRUCTURE FILES TO DOD STANDARDS TO ASSURE ELECTRONIC INTERCHANGEABILITY OF EXISTING NAVY TI. THE FIRST GOAL WILL BE MET BY DEFINING AND MODELING A SCANNER POST-PROCESSOR TO CORRECT SCANNER OUTPUT FILES PRIOR TO THE AUTOTAGGING PROCESS. THE POST-PROCESSOR WILL ADJUST MISALIGNED TABLES, CONFORM BLANKS TO A STANDARD, ISOLATED LITERATURE REFERENCE AND PERFORM NEEDED FILE CLEANUP. THE SECOND GOAL WILL BE MET BY IMPLEMENTING CONVERSION ROUTINES SUPPORTING IMPLEMENTATION OF AN INNOVATIVE SYSTEM CONCEPT FOR HIGH SPEED ELECTRONIC INFORMATION RETRIEVAL AND SCREEN DISPLAY. THE THIRD GOAL WILL BE MET BY USING DOD CALS STANDARDS AS A FOUNDATION FOR NEW SOFTWARE. WE WILL TEST USEABILITY OF THOSE STANDARDS FOR ELECTRONIC INFORMATION RETRIEVAL AND DISPLAY.

HYPER-VIEW SYSTEMS CORP
28 JACOME WY
MIDDLETOWN, RI 02840
Program Manager: ROBERT H WALLACE
Contract #:
Title: STANDARDIZED INTERACTIVE ELECTRONIC PRESENTATION OF WEAPON SYSTEM TROUBLESHOOTING
Topic #: N90-087 Office: NASC ID #: 40915

THIS PROPOSAL IDENTIFIES A STRATEGY, BASED ON NEW OFF-THE-SHELF TOOLS, PROTOTYPING, AND INTERACTION WITH MAINTENANCE PERSONNEL, FOR DEVELOPING INFORMATION PRESENTATION GUIDELINES WHICH SUPPORT MAINTENANCE PERSONNEL WITH VARIOUS EXPERIENCE LEVELS, THE ENVIRON- MENTS IN WHICH THE MAINTENANCE IS PERFORMED, THE DIFFERENT MEDIA AVAILABLE FOR ONLINE INFORMATION DISPLAY, AND THE COST-EFFECTIVE OF IMPLEMENTATION OF THE INFORMATION PRESENTATION MODEL. FOR THE PURPOSE OF THIS PROPOSAL, IT IS ASSUMED THAT THE SYSTEM IS BASED ON THE LATEST TECHNOLOGY THAT ENCOMPASSES MULTIPLE MEDIA INFORMATION STRUCTURING AND PRESENTATION, HYPERMEDIA. THE CONCEPT OF HYPERMEDIA AND ITS APPLICATION TO MAINTENANCE

AND TROUBLESHOOTING ARE DESCRIBED. HYPERMEDIA WILL ALSO FORM THE BASIS OF THE PROTOTYPES DEVELOPED FOR THIS EFFORT. HYPER-VIEW WILL ALSO EXAMINE CURRENT VISUALIZATION TECHNIQUES FOR PROBLEM SOLVING AND HOW THEY RELATE TO ONLINE PRESENTATION OF MAINTENANCE AND TROUBLESHOOTING INFORMATION. FINALLY, HYPER-VIEW WILL EXAMINE THE DEVELOPMENT OF AN "INTERMEDIATE" LOGIC REPRESENTATION THAT COULD BE USED TO TRANSLATE FROM A VARIETY OF CURRENT LOGIC REPRESENTATIONS INTO A MAINTENANCE KNOWLEDGE BASE TO BE USED BY EXPERT SYSTEMS.

SYNECTICS CORP
111 E CHESTNUT ST
ROME, NY 13440
Program Manager: ARNOLD H LANCKTON
Contract #:
Title: DIGITAL IMAGE VERIFICATION SYSTEM (DIVS)
Topic #: N90-091 Office: NASC ID #: 41140

THE DEVELOPMENT OF A DIGITAL IMAGERY VERIFICATION SYSTEM (DIVS) TO FULFILL THE NEED TO VERIFY THE IMAGE QUALITY OF ELECTRO-OPTICAL TACTICAL RECONNAISSANCE SYSTEMS DURING DEVELOPMENT AND ACQUISITION, AND DURING DAY-TO-DAY OPERATIONS. THE DIVS IS A TECHNOLOGY SPIN-OFF OF THE ADVANCED TACTICAL AIR RECONNAISSANCE SYSTEM (ATARS) CURRENTLY UNDER DEVELOPMENT BY THE DEPARTMENT OF DEFENSE. THROUGH THE UNIQUE INTEGRATION OF THE ATARS COMPONENTS AND A COMMERCIALLY AVAILABLE SILICON GRAPHICS WORKSTATION, A LOW DEVELOPMENT RISK, LOW COST, HIGH PERFORMANCE DIGITAL IMAGE VERIFICATION SYSTEM CAN BE DEVELOPED. THE DIVS WILL BE ABLE TO REPLAY ATARS IMAGERY RECORDED ON MIL-STD- 2179 MAGNETIC TAPES IN BOTH A SLOW PLAY AND IN A FREEZE FRAME MODE; A RANGE OF MAGNIFICATIONS FROM 1 TO 20 TIMES WILL BE PROVIDED. THE MISSION DATA WILL BE DISPLAYED IN A SEPARATE DISPLAY WINDOW. THE MAN-MACHINE INTERFACE WILL CONSIST OF STANDARD WINDOWS WITH APPROPRIATE FUNCTION KEYS AS REQUIRED. A UNIQUE APPLICATION OF SEVERAL INNOVATIVE METHODS OF VERIFYING IMAGE QUALITY WILL BE DEVELOPED FOR VERIFYING SENSOR PERFORMANCE.

SRS TECHNOLOGIES
PO BOX 9219 - 1500 QUAL ST/STE 350
NEWPORT BEACH, CA 92658
Program Manager: WAYNE PENNINGTON
Contract #:
Title: INTEROPERABILITY OF NAVY RANGE OPERATIONS WITH AIR TRAFFIC CONTROL FACILITIES OF THE FAA
Topic #: N90-092 Office: NASC ID #: 40917

NAVY FLEET AREA CONTROL AND SURVEILLANCE FACILITIES (FACSFACs), SUCH AS AT NAS FALLON, NAS JACKSONVILLE AND SAN DIEGO (NAS NORTH ISLAND) MANAGE NAVY SPECIAL USE AIRSPACE WHICH ARE SUBJECT TO AN EVER INCREASING VOLUME OF MILITARY AND CIVIL TRAFFIC. FACSFACs HAVE THE RESPONSIBILITY TO COORDINATE, CONTROL, AND SUPPORT ALL MILITARY SURFACE, SUBSURFACE AND AIR TRAFFIC IN THEIR DESIGNATED OPERATING AREAS (OPAREAs). SINCE THE OPAREAs ARE LOCATED ON/IN CONUS AND INTERNATIONAL WATERS AND AIRSPACE, THEY ARE SUBJECT TO TRANSIT BY NON-MILITARY USERS. THEREFORE A MEANS OF MONITORING ALL TRAFFIC IN OR NEAR THE OPAREAs IS REQUIRED. THE FACSFACs ARE ALSO REQUIRED TO MONITOR AND COORDINATE THE TRANSISTORS OF AIR TRAFFIC BETWEEN THE MILITARY AIRSPACE AND THE FEDERAL AVIATION ADMINISTRATION (FAA) NATIONAL AIRSPACE SYSTEM. IN GENERAL, MILITARY PRIORITIES PREEMPT CIVIL USE OF THESE AIRSPACES DURING SPECIFIED BLOCKS OF TIME. IN THE CASE OF THE NAS FALLON AIRSPACE COMPLEX, THE INCREASING VOLUME OF MILITARY AND CIVIL AIR TRAFFIC HAS DICTATED THE NEED TO CREATE THREE FAA CERTIFIABLE SHORT-RANGE (60 nm) AIR SEARCH TYPE RADARS WITHIN THE COMPLEX TO COVER THOSE AREAS OF HIGH AIR TRAFFIC DENSITY SO THAT BETTER CONTROL, AND THEREFOR JOINT

USE, MAY BE MADE OF THE AIRSPACE. THE FAA HAS A REQUIREMENT FOR NAS FALLON TO PROVIDE REAL-TIME AIRSPACE MANAGEMENT WITHIN THE AIRSPACE COMPLEX AREAS TO PROVIDE THEM (THE FAA) WITH REAL-TIME DATA THAT WILL ALLOW DYNAMIC SPECIAL USE AIRSPACE MANAGEMENT (DSUAM). DSUAM WILL ALSO REQUIRE THAT THE NAVY AND OTHER SERVICES OF THE DEPARTMENT OF DEFENSE BE PREPARED TO JUSTIFY THE USE OF TRAINING AREAS AT SHORT NOTICE EVERY DAY. THIS WILL ENTAIL MEANS OF EXCHANGING REAL-TIME INFORMATION ON AIRCRAFT FLIGHTS IN SPECIAL USE AIRSPACE, INCLUDING INFORMATION REGARDING SCHEDULING.

AIRSPACE TECHNOLOGY CORP
9 GOODYEAR
IRVINE, CA 92718
Program Manager: DAVID B WHITNEY
Contract #:
Title: MINI-AIR SURVEILLANCE RADAR TRACKER AND IFF SYSTEM (MASURATI)
Topic #: N90-093 Office: NASC ID #: 40918

AIR TRAFFIC CONTROL FACILITIES AT USN AND USMC AIR STATIONS ARE TYPICALLY FIXED INSTALLATIONS OR LARGE SCALE TACTICAL COMPLEXES. A NEED EXISTS FOR A SMALL, HIGHLY MOBILE RADAR AIR SURVEILLANCE CAPABILITY WHICH CAN BE RAPIDLY DEPLOYED AS A GAP FILLER OR TO PROVIDE RADAR APPROACH CONTROL SERVICES AT A BARE BASE. THE SYSTEM MUST PROVIDE BOTH PRIMARY AND SECONDARY RADAR CAPABILITIES WITH TARGET DETECTION AND TRACKING, HIGH RESOLUTIONN COMPACT FULL CAPABILITY DISPLAYS, AIR-TO-GROUND AND LAND MOBILE RADIOS, METEORO- LOGICAL INSTRUMENTATION AND ANCILLARY AND SUPPORT EQUIPMENT. THE SYSTEM MUST BE SHELTERIZED AND FULLY SELF CONTAINED, CAPABLE OF AUTONOMOUS OPERATION. THIS PROPOSAL ADDRESSES ONE APPROACH TOWARD PROVIDING THIS CAPABILITY USING THE USAF SURVELLANCE RESTORAL VEHICLE (SRV) AS THE BASELINE SYSTEM. SRV IS AN SSR ONLY AIRSPACE SURVEILLANCE SYSTEM; THIS PROPOSAL PRESENTS A PLAN FOR EXPANDING THE SRV CAPABILITIES THROUGH THE ADDITION OF A SHORT RANGE (15-20 MILE) PRIMARY RADAR AND AN ASSOCIATED TARGET TRACKER, AND AN EXPANDED PROCESSING AND DISPLAY CAPABILITY, INCLUDING THE ABILITY TO INTERFACE AND DISPLAY PRECISION APPROACH RADAR DATA. PHASE I WILL DEVELOP A BASIC SYSTEM CONCEPT, WITH A DETAILED SYSTEM DESIGN CONFIGURATION WHICH COULD LEAD TO A FULL SCALE DEVELOPMENT SPECIFICATION UNDER A PHASE II PROGRAM.

HARTMANN RESEARCH INC
5419 RIDGEDALE DR
DALLAS, TX 75206
Program Manager: CLINTON HARTMANN
Contract #:
Title: MICROWAVE-ACOUSTIC RESONATORS AND FILTERS FOR MMIC MODULES
Topic #: N90-094 Office: NASC ID #: 40920

THE TRI-SERVICE MMIC PROGRAM HAS ACHIEVED GOOD SUCCESS IN DEVELOPING MOST OF THE KEY ELEMENTS WHICH ARE NEEDED FOR MONOLITHIC MICROWAVE CIRCUITS. FOR EXAMPLE, AMPLIFIERS, MIXERS, FREQUENCY MULTIPLIERS, FREQUENCY DIVIDERS, MODULATORS, AND DEMODULATORS HAVE ALL BEEN SUCCESSFULLY DEMONSTRATED. HOWEVER, TWO KEY FUNCTIONS HAVE BEEN MISSING, NAMELY FREQUENCY FILTERS AND FREQUENCY SETTING ELEMENTS (FOR OSCILLATORS). CURRENT MMIC RESEARCH AS STILL RELIED ON OLDER (NON-MONOLITHIC) TECHNOLOGIES FOR PROVIDING THESE TWO CRITICAL FUNCTIONS WHICH ARE NECESSARY FOR COMPLETE MMIC SUBSYSTEMS. IF A SIGNIFICANT IMPROVEMENT IN RF AND MICROWAVE SUBSYSTEM SIZE IS TO OCCUR AS A RESULT OF THE MMIC EFFORT, A MAJOR ADVANCE MUST BE MADE TO ACHIEVE MONOLITHIC IMPLEMENTATION OF THESE TWO CRITICAL FUNCTIONS. FOR FREQUENCIES BELOW 1 GHz, SURFACE ACOUSTIC WAVE (SAW) AND BULK ACOUSTIC WAVE (BAW) TECHNOLOGIES HAVE PROVIDED EXCELLENT MONOLITHIC IMPLEMENTATIONS OF THESE TWO FUNCTIONS. THE PROPOSED PROGRAM WILL EXTEND THE FREQUENCY RANGE OF THESE ACOUSTIC

TECHNOLOGIES BY A FACTOR OF 10 THROUGH THE DEVELOPMENT OF AN INNOVATIVE NEW CLASS OF ACOUSTIC PROPAGATION MODES WHICH HAVE PHASE VELOCITIES THAT ARE UP TO 10 TIMES LARGER THAN CONVENTIONAL ACOUSTIC WAVE VELOCITIES. SUCCESSFUL COMPLETION OF THIS EFFORT WOULD MAKE A MAJOR BREAKTHROUGH FOR MICROWAVE FILTER AND RESONATOR TECHNOLOGY.

PACIFIC MONOLITHICS INC
245 SANTA ANA CT
SUNNYVALE, CA 94086
Program Manager: RICHARD SCOTT
Contract #:
Title: MICROMINIATURE FILTER TECHNIQUES
Topic #: N90-094 Office: NASC ID #: 40919

HIGH PERFORMANCE FILTERS ARE NEEDED IN MODERN ELECTRONIC SYSTEMS, BUT THE PERFORMANCE OF VARACTOR TUNERS IS NOT SUFFICIENT FOR MANY APPLICATIONS. THE TUNING ELEMENTS IN THIS PROPOSAL ARE FABRICATED WITH CONVENTIONAL MMIC TECHNOLOGY AND CAN BE USED IN INTEGRATED SYSTEMS TO REPLACE VARACTORS WITH IMPROVED SPECIFICATIONS. THIS HIGH INTERCEPT LEVEL TUNING SYSTEM ENABLES WIDEBAND MULTIPOLE FILTERS TO COVER A 3:1 FREQUENCY RANGE WITH DIRECT DIGITAL CONTROL. WE PROPOSE TO DEVELOF A LINE OF FILTERS, STARTING WITH THE CHOOSING OF OPTIMUM FILTER PROTOTYPES AND THE CONSIDERATION OF THE PRACTICAL PROBLEMS OF PARASITIC ELEMENTS. A PRACTICAL, COST-EFFECTIVE INTEGRATED CIRCUIT FILTER TECHNOLOGY WILL RESULT FROM THIS RESEARCH PROGRAM. ELINT, HDTV, ECM, AND RADAR FRONT ENDS WILL ALL BENEFIT FROM THIS WORK. AN ECM AND HDTV FILTER WITH +60 dBm SECOND ORDER AND +50 dBm THIRD ORDER DISTORTION INTERCEPTS WILL BE DESIGNED. IN PHASE II THESE FILTERS WILL BE FABRICATED.

L N K CORP
6811 KENILWORTH AVE - #306
RIVERDALE, MD 20737
Program Manager: SRINIVASAN RAGHAVAN
Contract #:
Title: AUTOMATED FEATURE EXTRACTION AND RECOGNITION OF NATURAL AND MAN-MADE FEATURES
Topic #: N90-095 Office: NASC ID #: 40921

LNK IS PROPOSING TO DEVELOP ALGORITHMS AND SOFTWARE FOR AUTOMATIC FEATURE EXTRACTION OF MAN MADE AND NATURAL FEATURES USING A VARIETY OF IMAGE SENSORS INCLUDING INFRARED, VISUAL AND RADAR. THE PROPOSED SYSTEM WOULD BE USED FOR BOTH GEOGRAPHIC DATABASE GENERATION AND AUTOMATIC UPDATING OF GEOGRAPHIC DATABASES FROM STRIKE AIRCRAFT. WE ARE PROPOSING AN APPROACH COMBINING NEURAL NETWORKS AND EXPERT SYSTEMS. THE PROPOSED SYSTEM IS A HYBRID NEURAL NETWORK COMBINING SEVERAL EXISTING PARADIGMS. THIS APPROACH ENABLES US TO TAKE ADVANTAGE OF THE STRENGTHS OF THE VARIOUS PARADIGMS BY APPLYING THEM TO PARTS OF THE RECOGNITION PROBLEM FOR WHICH THEY ARE MOST APPROPRIATE. THE SYSTEM REQUIRES AN INTERACTIVE TRAINING PHASE FOR INITIAL DATABASE GENERATION. DATABASE UPDATING FROM ON BOARD STRIKE AIRCRAFT IS DONE IN A FULLY AUTOMATIC MODE. NEURAL NETWORKS OFFER PROMISE OF PROVIDING THE SPEED AND ROBUTNESS REQUIRED FOR REAL-TIME UPDATING OF GEOGRAPHIC DATABASES.

REKENTHALER TECHNOLOGY ASSOCS CORP
3400 JENNINGS CHAPEL RD
WOODBINE, MD 21797
Program Manager: JEFFREY S BRUSH

Contract #:
Title: AUTOMATED FEATURE EXTRACTION AND PATTERN RECOGNITION ALGORITHMS
Topic #: N90-095 Office: NASC ID #: 40922

THIS PHASE I SBIR PROGRAM RESULTS IN AUTOMATIC FEATURE EXTRACTION AND MENSURATION OF CARTOGRAPHIC FEATURES FROM MULTISENSOR AND CARTOGRAPHIC (DFAD, DTED) TYPES OF DATA. TWO MAJOR INNOVATIONS ARE EXPLOITED FOR THIS PROGRAM – A NONLINEAR DYNAMICAL (NLD) PROCESSING APPROACH CAPABLE OF INTEGRATING AND PROCESSING "n-DIMENSIONAL" DATA SETS, AND A SOPHISTICATED MEDIAL AXIS TREE-GENERATION ROUTINE WHICH PRODUCES AN INVERTIBLE, ORTHONORMAL, HIGH FIDELITY REPRESENTATION OF THE FEATURES OF INTEREST. THESE TWO METHODOLOGIES ALLOW EXPLOITATION OF THE TREE REPRESENTATION TO RECOGNIZE CERTAIN CHARACTERISTICS OF THE NLD-GENERATED "n-DIMENSIONAL" DATA ASSOCIATED WITH A GIVEN FEATURE.

CENTER FOR REMOTE SENSING
PO BOX 9244
McLEAN, VA 22102
Program Manager: SUMAN GANGULY
Contract #:
Title: MICROWAVE POWERED HALE AIRCRAFT
Topic #: N90-096 Office: NASC ID #: 40923

THE NEED FOR A LONG ENDURANCE AIRCRAFT WHICH REQUIRES NO REFUELLING AND CAN PROVIDE SURVEILLANCE FOR NAVAL TASK GROUPS HAS BECOME EVIDENT. THE PROPOSED AIRCRAFT FOR THIS APPLICATION IS A MICROWAVE POWERED HALE PLANE. WITH THE USE OF MICROWAVE POWER BEAMING THE AIRCRAFT CAN BE CONTINUOUSLY ENERGIZED WHICH WOULD ALLOW MISSION DURATIONS OF MONTHS. THIS FIRST PHASE OF THE RESEARCH PROJECT WILL DETERMINE THE FEASIBILITY OF SUCH AN AIRCRAFT AND THE ASSOCIATED MICROWAVE POWER BEAMING SYSTEM. TECHNOLOGY DEFICIENCIES WILL BE INDICATED WHICH WILL PROVIDE THE BASIS FOR FURTHER WORK IN THE DEVELOPMENT OF THE HALE AIRCRAFT.

BERKELEY APPLIED SCIENCE & ENGR (BASE)
PO BOX 10104
BERKELEY, CA 94709
Program Manager: A R GANJI
Contract #:
Title: TRANSIENT BEHAVIOR SENSITIVITY ANALYSIS OF AIRCRAFT ENGINES
Topic #: N90-097 Office: NASC ID #: 40924

MANUEUVERABILITY AND SAFETY OF AIRCRAFT, SPECIALLY MILITARY PLANES HIGHLY DEPEND ON TRANSIENT POWER RESPONSE OF THEIR PROPULSION ENGINES. THE RATE AND LEVEL OF ENGINE RESPONSE WILL DEPEND ON MANY PARAMETERS INCLUDING ENGINE TYPE, ITS INTERNAL DESIGN CHARACTERISTICS AND ITS OPERATIONAL CONDITIONS. THIS PROPOSAL PRESENTS A RESEARCH APPROACH AND PLAN FOR IDENTIFICATION OF THE PARAMETERS WHICH HAVE NOTICEABLE EFFECT ON THE TRANSIENT POWER RESPONSE OF VARIOUS AIRCRAFT TURBO-ENGINES, MODELING THE COMPONENTS AND THE ENGINES, AND DEVELOPMENT OF A COMPUTER SOFTWARE TO SIMULATE THE TRANSIENT OPERATION OF THESE ENGINES. THE SPECIFIC APPLICATION OF THE DEVELOPED SOFTWARE WILL BE IN SENSITIVITY ANALYSIS OF THE TRANSIENT BEHAVIOR OF THESE ENGINES WITH RESPECT TO THEIR KEY DESIGN AND OPERATIONAL PARAMETERS. THE SOFTWARE WILL BE DESIGNED TO INTERFACE WITH U.S. NAVY ENGINE SIMULATORS.

ALLOY SURFACES CO INC

100 LOCKE RD
WILMINGTON, DE 19809
Program Manager: DAVID P DILLARD
Contract #:
Title: ACTIVATED METAL DECOY FOR LOW IR SIGNATURE AIRCRAFT
Topic #: N90-100 Office: NASC ID #: 40925

ACTIVATED STEEL FOIL FABRICATED INTO ELEMENTS TO BE PACKAGED AS EXPENDABLE DECOYS HAS SHOWN GOOD PERFORMANCE IN LOW IR SIGNATURE APPLICATIONS. THE PRESENT BATCH PRODUCTION PROCESS FOR THESE FOILS ENTAILS, IN PART, TWENTY HOURS OF FURNACE TREATMENT. A COMBINATION OF NINE SEPARATE OPERATIONS, LOW PRODUCTION RATES AND HIGH LABOR COSTS YIELDS A UNIT MANUFACTURING COST OF MORE THAN $250.00. WE PROPOSE TO DEVELOP A CONCEPTUAL DESIGN FOR MANUFACTURING ACTIVATED METAL BY A TIME, ELIMINATE SUCH HANDLING LABOR AND INCREASE THE PRODUCTION RATE TO MEET THE 5000 UNIT/MONTH PROGRAM REQUIREMENT AT A UNIT COST OF APPROXIMATELY $50. THE NEW TECHNIQUE INVOLVES THE APPLICATION OF A SLURRY COAT OF A DISPERSION OF METAL PRATICLES ON A CLEAN FOIL SURFACE FOLLOWED BY HEATING. THIS PROMOTES A HIGH TEMPERATURE SYNTHESIS REACTION (SHS) BETWEEN THE METAL PARTICLES, AND FORMS, WITHIN TEN (10) SECONDS, AN INSITU INTERMETALLIC COATING ON THE STEEL SURFACE. SUBSEQUENT SELECTIVE LEACHING PROVIDES THE CHARACTERISTICS SELF-IGNITING ACTIVATEDMETAL SURFACE. INDIVIDUAL STRIPS OF 1-MIL STEEL FOIL HAVE ALREADY BEEN PROCESSED BY THIS TECHNIQUE. ELEMENTS CUT FROM THIS STRIP DISPLAYED IR OUTPUTS COMPARABLE TO ELEMENTS PRODUCED BY THE OLD PROCEDURE.

PACIFIC-SIERRA RESEARCH CORP
12340 SANTA MONICA BLVD
LOS ANGELES, CA 90025
Program Manager: CHARLES S KAUFMAN
Contract #:
Title: MULTISPECTRAL ELECTRO-OPTICAL/INFRARED REAL TIME SENSOR TECHNOLOGY AND RISK IDENTIFICATION STUDY
Topic #: N90-101 Office: NASC ID #: 40926

PSR WILL IDENTIFY THE VARIOUS TECHNOLOGIES WHICH COULD BE UTILIZED IN THE DESIGN OF THE MULTISPECTRAL ELECTRO-OPTICAL/INFRARED (EO/IR) REAL-TIME SENSOR, AND THE RISKS ASSOCIATED WITH THESE TECHNOLOGIES. THIS STUDY WILL IDENTIFY RELEVANT COMPONENT TECHNOLOGIES THAT COULD BE USED IN THE DEVELOPMENT OF A LINE SCANNING SENSOR WHICH OPERATES SIMULTANEOUSLY IN THE EO AND IR SPECTRAL BANDS THROUGH A SINGLE APERTURE, AND WHOSE RAW OUTPUT IS COMPATIBLE WITH A HIGH SPEED DIGITAL DATA LINK. THE COMPONENT TECHNOLOGIES THAT WILL BE EVALUATED INCLUDE OPTICAL MATERIALS & COMPONENTS, SCANNING MECHANISM(S), SPECTRAL BEAM-SPLITTER(S), DETECTORS AND PRE-PROCESSING (AMPLIFICATION, ANALOG TO DIGITAL CONVERSION, AUTOMATIC GAIN & LEVEL CONTROL, DC RESTORATION, ETC.). PSR WILL ALSO ASSESS THE RELATIVE RISKS (TECHNOLOGICAL, SCHEDULE AND COST) ASSOCIATED WITH THE IDENTIFIED COMPONENTS TECHNOLOGIES, AND THE SYSTEM RISKS ASSOCIATED WITH VARIOUS CONFIGURATIONS THAT UTILIZE THE IDENTIFIED COMPONENT TECHNOLOGIES. PSR WILL UTILIZE ITS EXTENSIVE EXPERIENCE IN EO AND IR SYSTEMS TO REVIEW AND CORRELATE CUSTOMER SYSTEM LEVEL REQUIREMENTS WITH EXISTING TECHNOLOGY DATA BASES IN ORDER TO IDENTIFY AN OPTIMUM SET SENSOR DESIGN APPROACHES.

ROBOTIC VISION SYSTEMS INC
425 RABRO DR E
HAUPPAUGE, NY 11788
Program Manager: SULLIVAN S CHEN
Contract #:

Title: DATA INTERFACE FOR REAL-TIME PRINTED CIRCUIT BOARD SOLDERING STATISTICAL PROCESS CONTROL
Topic #: N90-103 Office: NASC ID #: 40927

THIS PROGRAM WILL RESULT IN THE PRELIMINARY DESIGN OF A REAL-TIME STATISTICAL PROCESS CONTROL SYSTEM FOR PRINTED CIRCUIT BOARD SOLDERING BASED ON THREE-DIMENSIONAL MEASUREMENTS OF SOLDER JOINT PARAMETERS. THE DEVELOPMENT OF SUCH A SYSTEM WOULD ALLOW IMMEDIATE CLOSED-LOOP ADJUSTMENTS TO UPSTREAM PRODUCTION EQUIPMENT VARIABLES AS SOLDER JOINT QULITY INDICATORS APPROACH CONTROL LIMITS. THE ANTICIPATED PROCESS CONTROL SYSTEM WOULD ALLOW THE TRANSITION FROM THE PRESENT OPEN-LOOP QUALITY CONTROL APPROACH OF "INSPECT-REWORK- REINSPECT" TO A TOTAL QUALITY MANAGEMENT PHILOSOPHY EMPHASIZING THE PREVENTION OF DEFECTS. THIS PHASE I EFFORT WILL INVESTIGATE ALTERNATIVES IN STATISTICS, DATA STRUCTURES, AND SAMPLING TECHNIQUES AS THEY APPLY TO SOLDER QUALITY, AND CONCLUDE WITH A PRELIMINARY SPC SYSTEM DESIGN, INCLUDING A USER-INTERFACE TO ALLOW STATISTICAL ANALYSIS FOR A VARIETY OF POPULATION CROSS-SECTIONS.

SPARTA INC
23041 AVENIDA DE LA CARLOTA - STE 400
LAGUNA HILLS, CA 92653
Program Manager: OLIVER CATHEY
Contract #:
Title: AIRCRAFT SURVIVABILITY AND MISSION ANALYSIS COMPUTER MODEL
Topic #: N90-104 Office: NASC ID #: 40928

SPARTA'S AIR DEFENSE EFFECTIVENESS MODEL (ADEM) WAS DEVELOPED SPECIFICALLY FOR THE ANALYSIS OF AIRCRAFT SURVIVABILITY AND MISSION EFFECTIVENESS. THE SIMULATION IS IN USE BY BOTH THE US ARMY AND USAF ADEM IS A MANY-ON-MANY MONTE CARLO SIMULATION OF A "BLUE" AIRBORNE FORCE PENETRATION OF "RED" SURFACE-TO-AIR AND AIR-TO-AIR DEFENSE. IT FEATURES PROGRAMMABLE AIRCRAFT (STRIKE, CAP, CAS, FAC, WEASEL, AWACS, AND EW); INTERNETTED SURFACE ASSETS (LLEW, EW, GCI, AND FC RADARS; ADC, ADCC, AND FILTER CENTER C3); 3 DOF AIRCRAFT AND MISSILES WITH G-SYNTHESIZED ATTITUDES AND INDUCED DRAGS (SAM'S, ARM'S. AGM'S AND AIM'S); COMMUNICATIONS (JTIDS, HAVE QUICK, SINCGARS, HF RADIO); ECM, ECCM, FLARES AND DECOYS. OUTPUTS INCLUDE AIRCRAFT SURVIVABILITY, MISSION EFFECTIVENESS AND CHARACTERIZATION OF THE RF ENVIRONMENT.

DCS CORP
1330 BRADDOCK PL
ALEXANDRIA, VA 22314
Program Manager: ABRAHAM ISSER
Contract #:
Title: MARINE ATTACK HELICOPTER NTS TRAINING SYSTEM
Topic #: N90-106 Office: NASC ID #: 40929

THE USMC NIGHT TARGETING SYSTEM (NTS), DESIGNED FOR INSTALLATION IN THE AH-1 ATTACK HELICOPTER BY 1994, IS REPRESENTATIVE OF THE MULTI-SENSOR SYSTEMS REQUIRING COMPREHENSIVE TRAINING FOR SKILLS OF AIR AND GROUND CREWS. DCS WILL CONDUCT A DETAILED STUDY OF TRAINING REQUIREMENTS FOR OPERATOR AND MAINTENANCE PERSONNEL IMPOSED BY THE INCORPORATION OF THE NIGHT TARGETING SYSTEM (NTS) IN THE AH-1W AIRCRAFT. TRAINING MATERIALS FOR THE CURRENT AH-1 EQUIPPED WITH THE TOW SIGHT UNIT (TSU) WILL CONSTITUTE AN NTS TRAINING SYSTEM BASELINE. NTS-PECULIAR TRAINING REQUIREMENTS WILL BE IDENTIFIED FOR BOTH OPERATORS AND GROUND CREWS TO FURTHER DEVELOP AN NTS TRAINING SYSTEM FROM THE BASELINE. ONCE FUNCTIONAL REQUIREMENTS ARE CLEARLY DELINEATED, DCS WILL ASSESS COMPUTER BASED AND TRADITIONAL TRAINING SYSTEM APPROACHES TO NTS. THE TRAINING PACKAGE WILL BE CONCEPTUALIZED TO INCLUDE

MISSION PLANNING/MISSION REHEARSAL PROCEDURES, SENSOR INFLIGHT BORESIGHT CONCEPTS, PERFORMANCE SAFETY GUIDELINES, AND NTS BIT AND GROUND TESTING PROCEDURES. NTS SENSOR PERFORMANCE PREDICTION IMPLEMENTATION REPRESENTS AN INNOVATIVE TOOL TO ENHANCE AIRCRAFT UTILIZATION AND MISSION SUCCESS.

GUIDED SYSTEMS TECHNOLOGIES
PO BOX 34131 - GEORGIA TECH
ATLANTA, GA 30332
Program Manager: J ERIC CORBAN
Contract #:
Title: INDEPENDENT ENGINEERING ANALYSIS OF PROPOSED AH-1W HELICOPTER FOUR-BLADED MAIN ROTOR DEVELOPMENT
Topic #: N90-107 Office: NASC ID #: 40930

THE U.S. MARINE CORP REQUIRES AN INDEPENDENT ENGINEERING ANALYSIS OF THE PERFORMANCE AND OPERATIONAL COST-BENEFITS OF FOUR BLADED MAIN ROTOR DEVELOPMENT FOR THE AH-1W ATTACK HELICOPTER. THE PROPOSED PHASE I EFFORT IS DESIGNED TO SATISFY THIS REQUIREMENT BY FIRST GATHERING APPROPRIATE ENGINEERING DATA ON BOTH THE BASELINE CONFIGURATION AND THE PROPOSED FOUR-BLADED MAIN ROTOR SYSTEM, DEVELOPING SUITABLE MODELS FOR THESE AIRCRAFT FROM THIS DATA SET, AND THEN EMPLOYING A FULLY DEVELOPED HELICOPTER PRELIMINARY DESIGN CODE (GTPDP) THAT HAS BEEN SUCCESSFULLY EMPLOYED IN SIMILAR HELICOPTER MODIFICATION ASSESSMENTS. THE ANTICIPATED PHASE II EFFORT WILL USE MORE ADVANCED ANALYSIS CODES SUCH AS DYSCO TO SUBSTANTIATE THE PHASE I PERFORMANCE ESTIMATES AND TO FULLY DEFINE THE TOTAL IMPACT OF THE CONTRACTOR PROPOSED FOUR-BLADED MAIN ROTOR SYSTEM ON THE AIRCRAFT STRUCTURES, DRIVETRAIN, AND DYNAMIC CHARACTERISTICS.

PRAXIS TECHNOLOGIES CORP
17 S BROAD ST - STE 200
WOODBURY, NJ 08096
Program Manager: KAYDON A STANZIONE
Contract #:
Title: INDEPENDENT ASSESSMENT AH-1W TECHNOLOGIES WHICH OFFER COST EFFECTIVENESS FOR INCREASED ATA COMBAT CAPABILITY
Topic #: N90-107 Office: NASC ID #: 40931

THIS STUDY SHALL ADDRESS TECHNICAL, OPERATIONAL, AND COST ISSUES INVOLVED REGARDING MODIFICATION OF THE U.S. MARINE CORPS AH-1W COBRA HELICOPTER. A DECISION-TREE FOUNDATION SHALL BE PROVIDED TO INDICATE THE RATIONALE ASSOCIATED WITH ANTICIPATED SYSTEM'S MODIFICATIONS. EMPHASIS SHALL BE GIVEN TO THE EVALUATION OF THCSE CONSIDERATIONS WHICH WILL SIGNIFICANTLY IMPROVE THE COBRA'S AIR COMBAT CAPABILITIES. ONE SUCH SOLUTION WHICH OFFERS PROMISE IS THE INSTALLATION OF AN ADVANCED ROTOR SYSTEM. THE PHASE I EFFORT SHALL EXAMINE THE TACTICAL REQUIREMENTS TO ESTABLISH SYSTEM DESIGN CRITERIA AND MEASURES OF EFFECTIVENESS. ONCE ESTABLISHED, THEN CONCEPTUAL AND PRELIMINARY ENGINEERING DESIGN STUDIES SHALL BE CONDUCTED. POTENTIAL ALTERNATIVE SOLUTIONS AND PRELIMINARY TRADE-OFF STUDIES ALONG WITH A QUALITATIVE ASSESSMENT OF ASSOCIATED RISKS AND COSTS SHALL ALSO BE PRESENTED. THIS STUDY SHALL ISOLATE REASONABLE COST-EFFECTIVE SOLUTIONS WHICH OFFER PROMISE IN ENHANCING THE AIR-TO-AIR COMBAT SURVIVABILITY OF THE COBRA. TECHNOLOGY DEVELOPMENTS WHICH MAY OFFER BENEFITS TO THE COMMERCIAL ROTARY WING INDUSTRY WILL ALSO BE HIGHLIGHTED. THE PHASE I EFFORT IS STRUCTURED TO PROVIDE BASELINE DATA FOR A COMPREHENSIVE COST AND OPERATIONAL EFFECTIVENESS ANALYSIS TO BE CONDUCTED IN PHASE II.

SIGMA PLUS INC
4001 WILLIAMSBURG CT
FAIRFAX, VA 22032
Program Manager: DANIEL J FEIGHERY
Contract #:
Title: TOTAL QUALITY MANAGEMENT (TQM) CONTROL CRITERIA APPLIED TO LONG TERM TEST PROGRAMS
Topic #: N90-109 Office: NASC ID #: 40933

THIS PROPOSAL BRINGS TOGETHER, IN A SMALL COMPANY ENVIRONMENT, A COMPREHENSIVE TEAM OF EXPERTS TO DIRECTLY APPLY TOTAL QUALITY MANAGEMENT (TQM) PRINCIPLES TO TOMAHAWK OPERATIONAL TEST LAUNCH (OTL) PROCESSES. IT PROVIDES FOR STRUCTURING TEST PROGRAMS TO IMPROVE TESTING QUALITY, PROVIDE FOR MORE EFFECTIVE RESOURCE UTILIZATION AND INCREASE TEST PROCESS COST EFFECTIVENESS. WE APPLY STRUCTURED ANALYTICAL MECHANISMS TO DESCRIBE THE CONCEPTUAL TOMAHAWK OPERATIONAL TEST LAUNCH (OTL) PROCESS. SPECIFIC PHASE I SUB-OBJECTIVES HAVE BEEN DEVELOPED TO ENSURE OUR PROCESS ACCOMMODATES REQUIREMENTS GENERATION AND PRIORITY, SEQUENTIAL EVENTS, EVALUATION OR DECISION POINTS, AND FEEDBACK TO TAKE ADVANTAGE OF LESSONS LEARNED. SOME TQM TOOLS TO BE APPLIED INCLUDE INPUT/OUTPUT ANALYSIS, AND CONTROL CHARTS. CRITICAL PATHS (AND THEIR INTERRELATIONSHIPS) IN EXISTING OTL PROCESSES WILL BE INVESTIGATED. A PROCESS-ORIENTED APPROACH ENSURES MARGINAL BENEFIT OF CHANGES IN EACH PROCESS SEGMENT ARE CONSIDERED TO MAXIMIZE OVERALL BENEFITS. INITIAL SELECTION OF EFFECTIVENESS MEASURES FOR TRADE-OFF ANALYSES, NEEDED FOR DETAILED PHASE II MODEL DEVELOPMENT, WILL ALSO BE ADDRESSED. A PRELIMINARY REVIEW OF CANDIDATE MODELS SUCH AS THE IDEF FAMILY AND PETRI-NET MODELS WILL ALSO BE INITIATED; THEREBY REDUCING RISK FOR THE PHASE II EFFORT.

S.T. RESEARCH CORP
PO BOX 1430 - 8419 TERMINAL RD
NEWINGTON, VA 22122
Program Manager: EDMOND WALSH
Contract #:
Title: SELF-PROTECT WEAPON SEEKER ENHANCEMENT (SIDEARM I)
Topic #: N90-111 Office: NASC ID #: 40935

PHASE I OF THIS PROJECT WILL ADDRESS THE FEASIBILITY OF SELF-PROTECT FOR WEAPON SEEKERS.

SIERRA NEVADA CORP
PO BOX 903 - 2465 W OLD HWY
VERDI, NV 89439
Program Manager: JOHN P CHISHOLM
Contract #:
Title: TEST/EVALUATION METHODOLOGY FOR PERFORMANCE MEASUREMENT OF AIRBORNE SURFACE SEARCH RADARS AGAINST OPERATIONAL/CONTRACTUAL SPECIFICATION
Topic #: N90-112 Office: NASC ID #: 40936

DESIGNING AND TESTING SURFACE SEARCH RADARS FOR DETECTING SMALL TARGETS ON SEA CLUTTER REQUIRES KNOWLEDGE OF THE MAGNITUDE AND TIME VARYING NATURE OF THE RADAR CROSS SECTION (RCS) OF BOTH THE TARGET AND THE SEA CLUTTER. A MAJOR FACTOR IN ESTABLISHING CLUTTER AND TARGET RCS IS THE MULTIPATH PHENMENON. IN THIS CONNECTION THE NAVY (DAVID TAYLOR RESEARCH CENTER) HAS RECENTLY ESTABLISHED A FACILITY (SCRIF) AT PMTC TO MEASURE THE RCS OF SHIPS UNDER SUCH CONTITIONS WITH THE CAPABILITY OF ESTABLISHING THE IMPACT OF THE SEA STATE, AND ASSOCIATED MULTIPATH ON SUCH MEASUREMENTS. IN ADDITION PMRF IS A POTENTIALLY SUITABLE RADAR INSTALLATION ON THE 1,500' MAKAHA RIDGE FOR SIMILAR MEASUREMENTS. IT IS PROPOSED TO:

(1) REVIEW THE LITERATURE AND CONSULT WITH APPROPRIATE NAVAL PERSONNEL, AND THEIR CONTRACTORS, ON THE DESIGN AND TEST OF SURVILLANCE RADARS WITH RESPECT TO SEA CLUTTER, TARGET SIZE AND THE MULTIPATH PHENOMENON, (2) REVIEW THE PMTC AND PMRF FACILITIES WITH RESPECT TO THEIR SUITABILITY FOR CONDUCTING APPLICABLE TESTS, (3) PREPARE A REPORT REFINING A STANDARD EVALUATION CRITERIA AND TEST PROCEDURE, (4) RECOMMEND WITHER PMRF OR PMTC AS THE LOCATION OF A SUITABLE TEST FACILITY AND OUTLINE THE ADDITIONAL EQUIPMENT, IF REQUIRED, FOR SUCH A FACILITY.

BLYTHE-NELSON
1999 BRYAN ST - STE 1100
DALLAS, TX 75201
Program Manager: DALE B LAWSON
Contract #:
Title: OPERATIONAL SUPPORT AIRCRAFT MANAGEMENT PLANNING SYSTEM
Topic #: N90-113 Office: NASC ID #: 40937

THIS EFFORT IS TO DEVELOP THE REQUIREMENTS AND THE SUBSEQUENT DESIGN AND IMPLEMENTATION OF A PC BASED ANALYTICAL SYSTEM FOR PPBS JUSTIFICATION; PEACE TIME AND WAR TIME OPERATIONAL PLANNING FOR THE OPTIMIZATION OF LIMITED OPERATIONAL SUPPORT AIRCRAFT ASSETS. PHASE I WILL CONSIST OF 1. IDENTIFYING RELEVANT DATA ELEMENTS WHICH INCLUDE AIRCRAFT COST, PERFORMANCE CAPABILITY AND CRITICAL DEMAND MODEL CONSIDERATIONS. 2. QUANTIFYING HISTORIC, CURRENT AND PROJECTED DEMANDS. 3. DEVELOP A DATA COLLECTION SYSTEM. 4. DEVELOP ASSESSMENT ALGORITHMS. THIS WILL PRECEDE THE DEVELOPMENT OF A PC BASED SYSTEM MODEL FOR PLANNING AND EXECUTION USE AT ALL LEVELS, I.E. OPNAV, NAVAIR, TYCOM, SQUADRON.

AMERICAN ELECTRONICS INC
9332 ANNAPOLIS RD
LANHAM, MD 20706
Program Manager: DAVID W ROSE
Contract #:
Title: SENSOR FUSION USING ELECTRO-OPTIC AND RADAR SIGNAL MODULATION DATA
Topic #: N90-114 Office: NASC ID #: 40938

THE NAVY F-14 FIGHTER CURRENTLY HAS TWO PRIMARY SYSTEMS WHICH CAN BE USED FOR THE IDENTIFICATION OF NON-COOPERATIVE AIR TARGETS: THE TELEVISION CAMERA SET (TCS) AND A RADAR SIGNAL MODULATION (RSM) PROCESSOR COUPLED TO THE AWG-9 FIRE CONTROL RADAR. CURRENTLY, DATA FROM THESE SYSTEMS IS PROCESSED INDEPENDENTLY, AND ANY FUSTION WHICH TAKES PLACE IS PERFORMED BY THE OPERATOR. THE OBJECTIVE OF THIS RESEARCH IS TO DEVELOP TECHNIQUES FOR FUSING THE ELECTRO-OPTIC (EO) DATA FROM THE TCS WITH THE RSM DATA FROM THE AWG-9. THREE FUSION TECHNIQUES WILL BE INVESTIGATED: - FUSION USING A FEEDFORWARD NEURAL NETWORK - FUSION USING A DEMSTER/SHAFER EVIDENTIAL REASONING METHOD - FUSION USING A EUCLIDIAN NEAREST NEIGHBOR CLASSIFIER. EACH OF THESE TECHNIQUES IS EXPECTED TO DISPLAY CERTAIN ADVANTAGES AND DISADVANTAGES IN ACCURACY/PERFORMANCE. THE FINAL EFFORT UNDER THIS PROPOSAL WILL THEREFORE BE TO DESIGN AND DEMONSTRATE A HYBRID FUSION SYSTEM WHICH DRAWS FROM THE STRENGTHS OF EACH OF THE THREE INDEPENDENT FUSION TECHNIQUES. AMELEX INTENDS TO TEAM WITH GRUMMAN AIRCRAFT SYSTEMS FOR THIS RESEARCH. AMELEX WILL CONTRIBUTE EXPERTISE IN RSM PROCESSING, NEURAL NETWORKS AND SENSOR FUSION, WHILE GRUMMAN WILL CONTRIBUTE EO TARGET RECOGNITION AND SENSOR FUSION CAPABILITIES.

TETRA CORP
4905 HAWKINS ST NE

ALBUQUERQUE, NM 87109
Program Manager: DR K J TOURYAN
Contract #:
Title: PULSE POWER FOR UNDERWATER NEUTRALIZATION
Topic #: N90-115 Office: NASC ID #: 40939

ONE OF THE IMPORTANT NEEDS FOR NAVAL SUBMARINE WARFARE IS THE CAPABILITY TO GENERATE INTENSE ACOUSTIC PULSES IN WATER FOR NEUTRALIZATION OF UNDERWATER DEVICES AND FOR SONAR APPLICATIONS. THIS PROGRAM IS TO DEVELOP A NEW HIGH POWER ACOUSTIC SOURCE THAT WILL OPERATE EFFICIENTLY IN SALT WATER AND AT DIFFERENT PULSE LENGTHS TO NEUTRALIZE VARIOUS UNDERWATER DEVICES. THIS SBIR PROPOSED PROGRAM TAKES ADVANTAGE OF SEVERAL RECENT TECHNOLOGY DEVELOPMENTS IN PULSED POWER AND WATER DISCHARGES. THE SYSTEM INCLUDES THE GENERATION OF HIGH ENERGY SPARKS IN SEA WATER, USING A NEW PROPRIETARY TECHNIQUE INVENTED BY TETRA CORPORATION. THIS NEW TECHNOLOGY WILL ENHANCE SUBSTANTIALLY THE NAVY'S CAPABILITY TO DAMAGE UNDERWATER EQUIPMENT AND WILL ALSO PROVIDE MEANS FOR CONDUCTING LONG RANGE SONAR MAPPING. THE OVERALL OBJECTIVE OF THIS PROGRAM IN PHASE I AND PHASE II IS TO DEVELOP HIGH ENERGY PULSED POWER SOURCES FOR PRODUCING SHOCKWAVES SUFFICIENT TO DAMAGE UNDERWATER EQUIPMENT. THE PHASE I OBJECTIVE IS TO DETERMINE THE FEASIBILITY OF THE CONCEPT BY CONDUCING SPECIFIC ACOUSTIC EXPERIMENTS IN SALT WATER USING AN EXISTING PULSE POWER TEST FACILITY.

CIMSPEC INC
4520 PONTIAC LAKE RD
PONTIAC, MI 48054
Program Manager: WILLIAM C ANDREWS JR
Contract #:
Title: MIGRATION SOLUTION FOR TRANSPARENT USER ACCESS TO INFORMATION SYSTEMS
Topic #: N90-119 Office: NSSC ID #: 41141

THE DISTRIBUTION AND ACCESS OF DATA IN A HIGHLY DECENTRALIZED ORGANIZATION CREATES SIGNIFICANT PROBLEMS AND INEFFICIENCIES IN MANAGEMENT, OPERATIONS, AND HUMAN RESOURCES. THREE STANDARDS PROGRAMS, IISS, PDES, AND GOSIP ADDRESS THE PROBLEM OF MULTI-VENDOR DATABASE ACCESS. THESE STANDARDS ARE ESSENTIAL, HOWEVER THEY CAN ONLY BE APPLIED TO "GREENFIELD" FACILITIES OR ISOLATED APPLICATIONS. BILLIONS OF DOLLARS IN INFORMATION SYSTEMS AND PRICELESS DATA THROUGHOUT GOVERNMENT AGENCIES AND THE PRIVATE SECTOR WILL BE ISOLATED FROM FUTURE SYSTEMS CONFORMING TO THESE STANDARDS WHICH PROMOTE FULL DATA TRANSPARENCY. WHAT IS NEEDED TO PROTECT THE INVESTMENTS IN INFORMATION SYSTEMS, AND TO PROVIDE A MIGRATION PATH FROM CURRENT VENDOR SPECIFIC ACCESS METHODOLOGIES TO A FULLY TRANSPARENT SYSTEM, IS A GATEWAY PROCESSOR FOR INFORMATION SYSTEMS. THE FOCUS OF CIMSPEC'S PHASE I PROPOSAL IS THE RESEARCH AND PRE- LIMINARY DESIGN OF A GATEWAY PROCESSOR WHICH ALLOWS USER/APPLICATIONS TO TRANSPARENTLY ACCESS TARGETED DATABASES, AND PROVIDE A MIGRATION PATH FOR CURRENT SYSTEMS TO A FULLY TRANSPARENT ARCHITECTURE. THE OUTPUT OF PHASE I IS THE PLAN TO CONSTRUCT AND DEMONSTRATE A PROTOTYPE THAT IS REPRESENTATIVE OF THE NAVY'S CURRENT INSTALLED BASE OF SYSTEMS.

SYMBIOTICS INC
875 MAIN ST
CAMBRIDGE, MA 02139
Program Manager: DR BRUCE H COTTMAN
Contract #:
Title: AN EXTENSIBLE ARCHITECTURE FOR INTEGRATING DISTRIBUTED HETEROGENEOUS DATABASE SYSTEMS
Topic #: N90-119 Office: NSSC ID #: 41142

IN TODAY'S RAPIDLY CHANGING AND HIGHLY COMPETITIVE ENVIRONMENT, UNIMPEDED ACCESS TO INFORMATION IS ESSENTIAL FOR AN ORGANIZATION'S GROWTH AND SURVIVAL. OPTIMAL INFORMATION ACCESS REQUIRES FULL, TRANSPARENT INTEGRATION OF AVAILABLE INFORMATION RESOURCES. UNFORTUNATELY, INFORMATION RESOURCES ARE TYPICALLY CREATED AND EVOLVE IN RESPONSE TO SPECIFIC, INDEPENDENT ADMINISTRATIVE, MANAGERIAL OR ENGINEERING PROBLEMS. AS A CONSEQUENCE, THESE RESOURCES END UP RESIDING ON DISTINCT DATABASES ON DISPARATE DATABASE MANAGEMENT SYSTEMS ON HETEROGENEOUS COMPUTERS AND COMPUTER NETWORKS. EXISTING INFORMATION SYSTEMS CANNOT OVERCOME THESE INCOMPATIBILITIES TO SUPPORT READY ACCESS TO THESE DISTRIBUTED DATA RESOURCES. THE FOCUS OF THIS PHASE I PROPOSAL IS THE RESEARCH AND DESIGN OF A PRODUCT THAT OFFERS A SOLUTION TO THESE PERVASIVE SYSTEM INTEGRATION PROBLEMS. META-VIEWS WILL CONSIST OF A SET OF HIGH-LEVEL DEVELOPMENT TOOLS FOR ACHIEVING UNIFORM ACCESS TO HETEROGENEOUS DATA SOURCES AND APPLICATIONS DISTRIBUTED ACROSS DIFFERENT VENDOR PLATFORMS. META-VIEW ALSO SUPPORTS THE INTEGRATION OF EMERGING TECHNOLOGIES, SUCH AS KNOWLEDGE-BASED SYSTEMS WITH EXISTING HETEROGENEOUS DATA RESOURCES, APPLICATIONS, AND SUPPORTING HARDWARE PLATFORMS. META-VIEW'S MAJOR TECHNICAL FETURES WILL BE A VENDOR INDEPENDENT INTERFACE LIBRARY, A UNIFORM DATA MODEL, HIGH PERFORMANCE TRANSFORMATION BETWEEN DISPARATE DATA MODELS, DATABASE LOCATION TRANSPARENCY AND PEER TO PEER DATA FLOW BETWEEN DISTRIBUTED APPLICATIONS.

RADIATION MONITORING DEVICES INC
44 HUNT ST
WATERTOWN, MA 02172
Program Manager: DR MICHAEL R SQUILLANTE
Contract #:
Title: A NEW NUCLEAR SURVEY INSTRUMENT WITH IMAGING CAPABILITY
Topic #: N90-120 Office: NSSC ID #: 41143

MODERN MILITARY OPERATIONS HAVE MADE IT NECESSARY FOR COMMANDERS TO HAVE RADIOLOGICAL INFORMATION CONCERNING NUCLEAR CONTAMINATION OF OCCUPIED AREAS. THIS INCREASING NEED FOR MORE ACCURATE AND RELIABLE INFORMATION FOR THE PURPOSE OF LOCATING AND IDENTIFYING POTENTIALLY HAZARDOUS NUCLEAR SOURCES, HAS LED TO NEED FOR IMPROVED INSTRUMENT- ATION. IN PARTICULAR, A NUCLEAR SURVEY INSTRUMENT WITH IMAGING CAPABILITY WOULD SIGNIFICANTLY IMPROVE THE EFFICIENCY WITH WHICH NUCLEAR SOURCES CAN BE LOCATED FROM REMOTE DISTANCES AND WOULD SUBSTANTIALLY REDUCE THE POTENTIAL HEALTH HAZARDS TO THE RADIATION SAFETY OFFICERS THAT USE THESE INSTRUMENTS. THE PROPOSED PROGRAM IS DESIGNED TO ESTABLISH THE FEASIBILITY OF DEVELOPING SUCH AN IMAGING NUCLEAR SURVEY INSTRUMENT. THIS DEVICE, WHEN USED IN CONJUNCTION WITH VIDEO CAMERA TECHNOLOGY WILL BE ABLE TO QUICKLY AND ACCURATELY LOCATE HIGH LEVEL SOURCES OF RADIATION FROM A DISTANCE OF 10 METERS OR MORE AND WILL SUBSTANTIALLY INCREASE THE ABILITIES AND CONFIDENCE OF THE PERSONNEL INVOLVED IN SUCH TASKS.

CAPE COD RESEARCH INC
PO BOX 600 - 95 MAIN ST
BUZZARDS BAY, MA 02532
Program Manager: FRANCIS KEOHAN
Contract #:
Title: LOW VOC TRANSDUCER COATINGS
Topic #: N90-125 Office: NSSC ID #: 41144

A RESEARCH PROGRAM IS PROPOSED TO IDENTIFY TECHNIQUES FOR REDUCING THE LEVEL OF VOLATILE ORGANIC COMPOUNDS IN PROTECTIVE COATINGS FOR TRANSDUCER ASSEMBLIES. THE EXPERIMENTAL THRUST OF THE PROGRAM EXPLORES THE FEASIBILITY OF USING NOVEL, WATER-REDUCIBLE COPOLYMERS AS THE BASE FOR HIGH PERFORMANCE, WATERBORNE TRANSDUCER COATINGS. THE ABILITY TO FORM

DURABLE BARRIER COATINGS ON METALLIC SURFACES FOR UNDERWATER DEPLOYMENT WITHOUT THE NEED FOR EXCESSIVE AMOUNTS OF ORGANIC SOLVENTS WOULD REPRESENT A SIGNIFICANT ADVANCEMENT IN ANTICORROSION COATING TECHNOLOGY. IF SUCCESSFUL, THIS WATERBORNE COATING APPROACH COULD BE USED FOR OTHER DEMANDING MARINE MAINTENANCE APPLICATIONS.

DEFENSE GROUP INC
1901 N MOORE ST - STE 1000
ARLINGTON, VA 22209
Program Manager: DR MICHAEL SOIMAR
Contract #:
Title: NON-LOW MAGNETIC SIGNATURE ENGINES
Topic #: N90-126 Office: NSSC ID #: 40941

DGI CURRENTLY HAS LIGHTWEIGHT, LOW VOLUME ROTARY (I.E., WENKEL) ENGINES CAPABLE OF PRODUCING OUTPUTS IN THE 80 TO 150 HP RANGE. THESE ENGINES HAVE ALUMINUM HOUSING (BODIES) BUT OTHER PARTS OF THE ENGINE ARE STEEL MADE OR OTHER FERROUS METALS. DGI PROPOSES A PROGRAM TO REDUCE THE MAGNETIC SIGNATURE OF A 150 HP ENGINE. THIS WILL BE DONE THROUGH IDENTIFICATION OF THE PARTS OF THE ENGINE WITH MAGNETIC SIGNATURES, AND THE SUBSEQUENT CHOICE OF ALTERNATIVE MATERIALS FOR THESE PARTS. THE ALTERNATIVE MATERIALS AVAILABLE ARE ALUMINUM, HEAT RESISTANT METALS, CERAMICS AND STATE-OF-THE-ART PLASTICS. THE CHOICE FOR EACH OF THE PARTS TO BE REPLACED IS NOT OBVIOUS BECAUSE MANY CONSIDERATIONS ENTER INTO THE DECISION. THESE FACTORS INCLUDE THE ABILITY OF THE COMPONENT TO ENDURE HEAT AND WEAR; THE ABILITY WITH WHICH THE MATERIAL CAN BE WORKED TO PRODUCE THE PART; THE ABILITY OF THE MATERIAL TO WITHSTAND VIBRATION, SHOCK AND OTHER MECHANICAL STRESSES; AND THE FUTURE COST OF THE COMPONENT. THE PHASE I OF THE SBIR, DGI PROPOSES THE EVALUATION OF THE CHANGES NEEDED AND WILL PRODUCE A PLAN FOR PRODUCTION OF A PROTOTYPE ENGINE. THIS ENGINE WILL BE TESTED WITH RESPECT TO TWO SETS OF CRITERIA. THE FIRST WILL BE THE REDUCTION IN MAGNETIC SIGNATURES BETWEEN THIS ENGINE AND A NORMAL ROTARY ENGINE. THE SECOND SET OF CRITERIA WILL BE TO TEST THE ENGINE FOR PERFORMANCE AND DURABILITY, AND TO DETERMINE IF THIS IS IN ANY WAY CHANGED BY THE INCLUSION OF A NON-MAGNETIC COMPONENT.

PLANNING SYSTEMS INC
7925 WESTPARK DR
McLEAN, VA 22102
Program Manager: CHARLES HOLLAND
Contract #:
Title: ACOUSTIC PROPAGATION PATH DETERMINATION
Topic #: N90-127 Office: NSSC ID #: 41219

THIS PROPOSAL PRESENTS AN INNOVATIVE APPROACH TO DETERMINING THE PROPAGATION PATH OF ACOUSTIC DATA RECEIVED BY A THIN LINE TOWED ARRAY. WE MAKE USE OF THE LATEST DEVELOPMENTS IN SEAFLOOR ACOUSTIC MODELING CAPABILITY AS WELL AS EMPLOYING THE EMERGING AND POWERFUL TECHNIQUES ASSOCIATED WITH ARTIFICAL NEURAL NETWORKS. THE PROPOSED NEURAL NETWORKS WILL BE DESIGNED TO IDENTIFY THE PATH OF PROPAGATION FROM AN ARBITRARY RECEIVED SIGNAL BASED ON TRAINING FROM AN ACOUSTIC PROPAGATION MODEL. THE FEASIBILITY OF EMPLOYING NEURAL NETWORKS FOR PATH DISCRIMINATION IN DIVERSE DEEP-WATER ENVIRONMENTS WILL BE DETERMINE USING SYNTHETIC DATA.

SEAKAY MANAGEMENT CORP
8 PLANT DR

WATERFORD, CT 06385
Program Manager: OREN B COOKE
Contract #:
Title: AZIMUTHAL NOISE VARIATION EXPLOITATION (AZNOVEX)
Topic #: N90-128 Office: NSSC ID #: 41220

A SYSTEM IS PROPOSED FOR ASW PLATFORMS TO GENERATE AND DISPLAY THE AMBIENT NOISE LEVELS ABOUT THE AZIMUTH INDEPENDENT OF THE SENSORS OR THE SHIPS'S OWN RADIATED NOISE EFFECTS. THE PROPOSED AZIMUTHAL NOISE VARIATION EXPLOITATION (AZNOVEX) SYSTEM WOULD USE NOISE MEASUREMENTS MADE THROUGH THE SHIP'S ACOUSTIC SENSORS TOGETHER WITH MODELS OF THE SHIP'S RADIATED NOISE AND ACOUSTIC SENSOR PERFORMANCE TO DERIVE THE AMBIENT NOISE PROFILE. DISPLAYS AND UPDATES WOULD SUPPORT DETECTION AND COUNTERDETECTION VULNERABILITY ASSESSMENTS IN ALL PHASES OF ANTI-SUBMARINE WARFARE. THE SYSTEM WOULD RECOMMEND OWNSHIP MANEUVERS AND FREQUENCY OF OWNSHIP MANEUVERS BASED ON THE ENVIRONEMENT AND TACTICAL SITUATION.

SONALYSTS INC
PO BOX 280 - 215 PARKWAY N
WATERFORD, CT 06385
Program Manager: DR JOHN JAKACKY
Contract #:
Title: AZIMUTHAL NOISE VARIATION EFFECTS
Topic #: N90-128 Office: NSSC ID #: 41221

THE OBJECTIVE IS TO CREATE A ROBUST AMBIENT NOISE MODEL THAT CAN BE USED IN CURRENT AND FUTURE TACTICAL ACOUSTIC PERFORMANCE PREDICTION (APP) PROGRAMS TO SUPPORT REAL-TIME EVALUATION, PREDICTION CAPABILITIES, AND WHAT-IF ANALYSES. CURRENT SYSTEMS MEASURE AMBIENT NOISE IN BEAMS, BUT THE NOISE DATA BECOMES OBSOLETE AS THE TACTICAL GEOMETRY CHANGES. AN IMPROVED NOISE MODEL WILL ENHANCE THE ACCURACY AND OPERABILITY OF CURRENT TACTICAL APP SYSTEMS.

SYSTEMS INTEGRATED
10635 SCRIPPS RANCH BLVD - STE F
SAN DIEGO, CA 92131
Program Manager: ERIK HOLMSTROM
Contract #:
Title: TECHNIQUE FOR ESTIMATING AZIMUTH NOISE VARIATION EFFECTS
Topic #: N90-128 Office: NSSC ID #: 41222

THIS PROPOSAL DESCRIBES A METHODOLOGY FOR UTILIZING TOWED ARRAY BEAM NOISE DATA AND NEAR REAL-TIME AND/OR HISTORICAL AMBIENT NOISE DATA TO CALCULATE AND EXPLOIT NOISE FIELD DIRECTIONALITY TO ACCOUNT FOR THE IMPACT OF DYNAMIC NOISE VARIATIONS ON ASW SEARCH PLANNING AND SENSOR EMPLOYMENT. THE PROPOSED APPROACH TO PROVING THE EFFICACY OF THE METHODOLOGY WILL UTILIZE AN EXISTING AND EXTENSIVE DATA SET ACQUIRED FROM A SURTASS ARRAY DURING THE AEAS PROGRAM EXERCISE OUTPOST SUNRISE. ANALYSES OF NOISE FIELD DIRECTIONALITY USING THAT DATA SET HAVE ALREADY CONCLUSIVELY SHOWN THAT SIGNAL TO NOISE GAINS IN EXCESS OF 15 dB ARE AVAILABLE FOR TACTICAL EXPLOITATION. WITH AN ADDITIONAL ANALYTICAL EFFORT BY SI IT WILL BE POSSIBLE TO SHOW THE FEASIBILITY OF EXPLOITING THE NOISE FIELD STRUCTURE TO ACCOUNT FOR REAL-TIME CHANGES IN AZIMUTHAL NOISE IN ASW ACOUSTIC SENSOR EMPLOYMENT.

ARCCA INC

130 ALMSHOUSE RD - STE 107A
RICHBORO, PA 18954
Program Manager: EDWARD J RAMSAY
Contract #:
Title: DEVELOPMENT OF A MIL-STD-480B EXPERT SYSTEM TOOL
Topic #: N90-129 Office: NSSC ID #: 41223

THE PREPARATION OF ENGINEERING CHANGE PROPOSALS IS OFTEN A COMPLEX PROCESS BECAUSE OF THE EXTENSIVE REQUIREMENTS OF MIL-STD-480B. STATE-OF-THE-ART COMPUTER TECHNOLOGY CAN PROVIDE EXTENSIVE ASSISTANCE TO BOTH THE EXPERIENCED AND INEXPERIENCED ENGINEER. A COMPUTERIZED ECP PREPARATION SYSTEM WOULD PROVIDE SEVERAL OBVIOUS ADVANTAGES TO THE USER ENGINEER INCLUDING DATA STORAGE PREPARATION. THE USE OF A DATA/TEXT/FORM MANAGEMENT SYSTEM SUCH AS HYPER-CARD CAN PROVIDE THE USER WITH ALL OF THE COMMON BENEFITS OF A DBMS SUCH AS USER-FRIENDLY DATA ENTRY AND EDITING, EASE OF NAVIATION THROUGHOUT THE DATABASE BY SEARCHING FOR RECORDS (ECP'S) WITH SPECIFIC FIELD VALUES, QUERY GENERATION, AD-HOC REPORT GENERATION, ETC. THE ADDITIONAL ADVANTAGES TO BE FOUND BY INFUSING AN ECP DATA MANAGEMENT SYSTEM WITH AN EXPERT SYSTEM ARE INNUMERABLE. IN ADDITION TO SUGGESTING INPUT VALUES, THE EXPERT SYSTEM CAN PERFORM EXTENSIVE DATA VERIFICATION AND VALIDATION AND INSURE STRICT CONFORMANCE WITH 480B REQUIREMENTS THROUGH THE USE OF THE SAME RULES.

NORTH STAR TECHNOLOGY INC
PO BOX 482 - CHURCH ST
LIMESTONE, ME 04750
Program Manager: PAUL R YOUNG
Contract #:
Title: MIL-STD-480B EXPERT SYSTEM TOOL COMPOUND
Topic #: N90-129 Office: NSSC ID #: 41224

THIS WORK COMBINES THE PROBLEM STRUCTURING TOOLS AVAILABLE IN HYPERMEDIA PRODUCTS, WITH EXPERTISE REPRESENTATION APPROACHES FROM TRADITIONAL EXPERT SYSTEM TECHNOLOGY IN ORDER TO CREATE A DESIGN FOR AN ACQUISITION PROGRAM MANAGER'S ECP PREPARATION TOOL. THE TOOL WILL BE CAPABLE OF ASSISTING PMS IN NAVIGATING THE ECP PREPARATION PROCESS BY CONSIDERING MAJOR FEATURES OF THE GIVEN SYSTEM AND CHANGE, AND THEN RECOMMENDING APPROPRIATE STEPS IN COMPLIANCE WITH MIL-STD-480B.

MEDICAL SAFE-TEC
5610 W 82ND ST
INDIANAPOLIS, IN 46278
Program Manager: JOSEPH H WILSON
Contract #:
Title: SHIPBOARD MEDICAL WASTE TREATMENT SYSTEM
Topic #: N90-130 Office: NSSC ID #: 41225

THIS PROJECT IS DIRECTED TO THE DEVELOPMENT OF A SHIPBOARD MEDICAL WASTE TREATMENT SYSTEM. THIS SYSTEM MUST MEET ALL THE REQUIREMENTS OF A LAND-BASED SYSTEM, PLUS THOSE ABOARD A NAVAL VESSEL. THE LATTER HAS THE GREATER PREMIUM ON SPACE, THE GREATER NEED FOR RELIABILITY OF OPERATION AND EASE OF REPAIR, AND THE EVEN GREATER REQUIREMENT FOR SAFETY AND PREVENTION OF INFECTION. TO MEET THESE OBJECTIVES WE HAVE SELECTED A MECHANICAL-CHEMICAL TREATMENT SYSTEM WHICH SATURATES THE WASTE WITH A HIGH-LEVEL DISINFECTANT, SODIUM HYPOCHLORITE, AND PULVERIZES IT INTO SAND-LIKE PARTICLES IN A ULTRA HIGH-SPEED HAMMERMILL. THIS REDUCES THE VOLUME AS MUCH AS 10 FOLD. THIS EQUIPMENT FOR LAND-BASED SYSTEMS HAS BEEN DEVELOPED AND EMPLOYED WITH SATISFACTION IN HOSPITALS. IN THIS

RESEARCH WE WILL DEVISE A SYSTEM FOR SHIPBOARD USE BASED ON THIS PRINCIPLE. WE WILL (1) DEVELOP DESIGNS FOR REDUCING SPACE REQUIREMENTS OF THE APPARATUS, (2) GENERATE THE DISINFECTANT ON BOARD FROM SALT WATER AS NEEDED SO IT WILL NOT HAVE TO BE STORED, AND (3) IMPROVE THE EFFICIENCY OF THE OPERATION BY DEVELOPING A SPECIAL SHREDDING MACHINE THAT WILL PERMIT THE HAMMERMILL TO MORE RAPIDLY DISINTEGRATE WASTES THAT TAKE LONGER TO GRIND.

CLEVER FELLOWS INNOVATION CONSORTIUM INC
R.D. 1 - BOX 410
MELROSE, NY 12121
Program Manager: JOHN COREY
Contract #:
Title: EVALUATION OF SHIPBOARD (USE OF) ERICSSON-CYCLE AIR CONDITIONER
Topic #: N90-131 Office: NSSC ID #: 41226

A ROTARY ERICSSON-CYCLE AIR CONDITIONING MACHINE HAS BEEN DEVISED (PAT. PENDING) AND CONSTRUCTED IN BREADBOARD FORM WHICH PROVIDES NON-CFC REFRIGERATION IN A COMPACT, RELIABLE, UNIT, OFFERING COMPETITIVE COP WITHOUT SPECIALTY FLUIDS. THIS PROJECT SEEKS TO QUANTIFY AND EVALUATE THE TECHNOLOGY'S APPLICABILITY TO SHIPBOARD SERVICES BY ENLARGING THE DEVICE FROM ITS CURRENT STATUS AS A 1-TON BREADBOARD WITH DESIGNS AT 50-TON (COMMERCIAL) TO 10, 200, & 400 TON DESIGNS. THERMODYNAMIC PERFORMANCE WILL BE PROJECTED USING AN EXTANT SIMULATION CODE. DETAIL DESIGNS FOR A 10-TON PROTOTYPE UNIT WILL ALSO BE PREPARED.

MAINSTREAM ENGINEERING CORP
200 YELLOW PL
ROCKLEDGE, FL 32955
Program Manager: JOHN J SILVESTRI
Contract #:
Title: A MALONE HEAT PUMP FOR USE AS A SHIPBOARD AC SYSTEM
Topic #: N90-131 Office: NSSC ID #: 41227

THE INTENT OF THIS PHASE I PROPOSAL IS TO DETERMINE THE FEASIBILITY OF USING A LIQUID STIRLING CYCLE, ALSO KNOWN AS A MALONE CYCLE, AS A NON-VAPOR COMPRESSION AC PLANT FOR POTENTIAL SHIPBOARD USE. THE PHASE I EFFORT WILL CONCENTRATE ON THEORETICAL MODELING OF, AND DETERMINATION OF ALTERNATIVE WORKING FLUIDS FOR, THE MALONE HEAT PUMP IN ORDER TO DETERMINE THE OPTIMUM DESIGN PARAMETERS FOR SUCH A CYCLE. ALSO, CRITICAL PARAMETERS OF THE CYCLE INCLUDING SIZE, WEIGHT, EFFICIENCY, RELIABILITY, AND SAFETY SHALL BE ADDRESSED. RESULTS OF THE PHASE I EFFORT WILL REVEAL IF IT IS PRACTICAL TO USE THE MALONE CYCLE AS A HEAT PUMP FOR SHIPBOARD USE, AND IF PRACTICAL, WILL DESCRIBE THE FLUID OR FLUIDS OF CHOICE FOR USE IN SUCH A CYCLE.

ESSEX CORP
333 N FAIRFAX ST
ALEXANDRIA, VA 22314
Program Manager: F REID WILLIS
Contract #:
Title: INTEGRATED ON-LINE R&M DESIGN PROGRAM
Topic #: N90-132 Office: NSSC ID #: 41228

THE OVERALL GOAL OF THE PROPOSED RESEARCH IS TO SUPPORT THE NAVY SYSTEM ENGINEERING AND LOGISTIC PLANNING COMMUNITY WITH A RESPONSIVE COMPUTER-AIDED R&M DESIGN TOOL THAT USES

COMPUTER-AIDED ACQUISITION AND LOGISTIC SUPPORT (CALS) COMPATIBLE DATA AND OPERATES IN A WORK STATION ENVIRONMENT. THE DEVELOPMENT OF THIS ON-LINE R&M DESIGN CAPABILITY DEMANDS ADVANCED CONCEPTS OF PROGRAM EXECUTION SPEED, USER INTERFACE AND DATA ACCESS. ITS SUCCESS IS CONTINGENT UPON THREE ESSENTIAL ELEMENTS: A QUICK-RESPONSE R&M PROGRAM WITH TIGER CAPABILITIES; INTELLIGENT, INTERACTIVE USER CONTROL; LINKAGE TO THE NECESSARY DATA.

HYDRODYNAMICS RESEARCH ASSOCS
1146D WALKER RD
GREAT FALLS, VA 22066
Program Manager: J OTTO SCHERER JR
Contract #:
Title: ADVANCED PROPELLER BLADE SECTIONS
Topic #: N90-133 Office: NSSC ID #: 41229

IT IS PROPOSED TO INVESTIGATE AND DEVELOP INNOVATIVE PROPELLER BLADE SECTION GEOMETRY WHICH WILL RESULT IN IMPROVED ACOUSTIC AND POWERING PERFORMANCE OF SURFACE SHIPS THROUGH THE ATTAINMENT OF HIGHER CAVITATION INCEPTION SPEEDS AND REDUCE BLADE DRAG. THESE SECTIONS ARE CHARACTERIZED BY A BLUNT TRAILING EDGE WITH A SEPARATED, NON- CAVITATING WAKE. THE EFFECT OF THE BLUNT TRAILING EDGE, WHEN COUPLED WITH AN APPROPRIATE SECTION PROFILE, IS TWOFOLD: 1) THE LOW PRESSURE ON THE BLADE SURFACE IS RELIEVED WHICH RESULTS IN A DELAY OF THE ONSET OF CAVITATION; 2) THE THICKENED TRAILING EDGE INCREASES THE SECTION MODULUS WHICH CAN LEAD TO A REDUCTION IN DRAG FOR A GIVEN STRENGTH REQUIREMENT. THE PROPOSED PHASE I WORK IS DIVIDED INTO TWO TASKS: TASK 1 WILL BE DIRECTED TO EXPLORATORY DEVELOPMENT THROUGH PARAMETRIC STUDIES AIMED AT DETERMINING THE MOST SUITABLE PROFILES WITH REGARD TO CAVITATION INCEPTION, STRENGTH, AND DRAG. THIS DATA WILL BE ANALUZED TO IDENTIFY DESIRABLE FOIL CHARACTERISTICS AND TRENDS. TASK 2 WILL QUANTIFY THE POTENTIAL GAINS IN EFFICIENCY AND/OR CAVITATION INCEPTION SPEED IN ACTUAL SHIP APPLICATIONS. IT IS PROPOSED TO CARRY OUT DESIGN STUDIES FOR TWO REPRESENTATIVE NAVY SHIPS WHICH PROVIDE AN ESTABLISHED BASELINE. WE HAVE TENTATIVELY SELECTED THE AO 177 AS REPRESENTATIVE OF A MODERATE SPEED AUXILLARY, AND THE DDG 51 FLIGHT III AS REPRESENTATIVE OF A MODERN COMBATANT.

CONCEPTUAL SOFTWARE SYSTEMS INC
17962 SUN KNOLL DR
YORBA LINDA, CA 92686
Program Manager: ED P ANDERT
Contract #:
Title: NAVAL SURFACE COMBATANT SHIP DESIGNER'S AID
Topic #: N90-134 Office: NSSC ID #: 41230

THE NAVAL SURFACE COMBATANT SHIP DESIGN PROCESS CAN BE GREATLY ENHANCED BY A COMPUTERIZED, KNOWLEDGE-BASED DESIGNER'S AID. NAVAL SURFACE SHIP DESIGN IS A TECHNOLOGICAL CHALLENGE TO "MAXIMIZE ORDNANCE ON TARGET" REQUIRING THE USE OF RAPIDLY ADVANCING TECHNIQUES AND SYSTEMS FOR SURVEILLANCE, DETECTION, COMMUNICATION, INFORMATION PROCESSING, ORDNANCE DELIVERY, POWER, AMONG OTHERS. A COMPUTERIZED, KNOWLEDGE-BASED AID IS PROPOSED TO HELP THE SHIP DESIGNER INCORPORATE THE MOST APPROPRIATE HULLS, MACHINERY, AND ELECTRICAL SYSTEM (HM&E) AND COMBAT SYSTEMS YIELDING THE CORRECT PERFORMANCE ATTRIBUTES TO MEET TOP-LEVEL SHIP, MISSION, AND OPERATIONAL REQUIREMENTS. THE KNOWLEDGE-BASED AID WILL SELECT HM&E AND COMBAT SYSTEMS THAT ARE APPROPRIATE FOR DESIGNER INPUT SHIP, MISSION, AND OPERATIONAL REQUIREMENTS. ONCE THE HM&E AND COMBAT SYSTEMS HAVE BEEN REVIEWED AND POSSIBLY MODIFIED BY THE DESIGNER THE COMPUTER SYSTEM WILL REPORT THE RESULTING CHARACTERISTIC PERFORMANCE ATTRIBUTES. BASED ON THESE PERFORMANCE

ATTRIBUTES THE KNOWLEDGE-BASED AID WILL REPORT TOTAL SHIP MEASURES OF EFFECTIVENESS (MOE) AND COMPARE THEM TO CURRENT SHIPS WITH SIMILAR MISSION PROFILES. A KNOWLEDGE-BASED SYSTEM WILL BE DESIGNED WITH AN INTERACTIVE ENVIRONMENT THAT REPORTS ON SYSTEMS, PERFORMANCE ATTRIBUTES, AND MOE AS WELL AS ALLOWING SHIP DESIGNERS TO UPGRADE AND DISTRIBUTE THE KNOWLEDGE-BASE.

NKF ENGINEERING INC
4200 WILSON BLVD - STE 1000
ARLINGTON, VA 22203
Program Manager: DR RONALD M REESE
Contract #:
Title: SHIP DESIGN TOOLS - MEASURES OF EFFECTIVENESS
Topic #: N90-134 Office: NSSC ID #: 41231

THIS STUDY WILL BE CONCERNED WITH THE DEVELOPMENT OF A PROTOTYPE EXPERT SYSTEM WHICH WILL ACCOMPLISH TWO MAJOR FUNCTIONS WHEN IT IS COMPLETED. THE FIRST FUNCTION WILL CONSIDER TOP LEVEL SHIP, MISSION AND OPERATIONAL REQUIREMENT TO PRODUCE A LIST OF HULL, MECHANICAL AND ELECTRICAL (HM&E) SYSTEMS AND COMBAT SYSTEMS WHICH COULD BE USED IN THE DESIGN TO MEET THE REQUIREMENTS. WHERE APPROPRIATE, THE FIRST FUNCTION WILL ALSO SUGGEST THE QUANTITY OF COMPONENTS, SUCH AS THE NUMBER OF ILLUMINATORS. THE FIRST FUNCTION WILL BE IMPLEMENTED BY DEVELOPING LISTS OF GENERIC REQUIREMENTS, SYSTEMS AND RULES RELATING THE REQUIREMENTS TO THE SYSTEMS. THE SECOND MAJOR FUNCTION OF THE EXPERT SYSTEM WILL BE CONCERNED WITH USING A LIST OF SYSTEMS TO GENERATE TOTAL SHIP MEASURES OF EFFECTIVENESS (MOEs) IN THE SEVEN MISSION DRIVERS (BATTLESPACE, FIREPOWER, BATTLE MANAGEMENT, SUITABILITY, SURVIVABILITY, MOBILITY AND READINESS). THE MOEs WOULD BE USED IN TRADE-OFF STUDIES AND FOR *COMPARISONS WITH THE MOEs* OF CURRENT SHIP TYPES. A COMMERCIAL EXPERT SYSTEM SHELL, POSSIBLY INSTANT-EXPERT PLUS ON THE APPLE MACINTOSH, WILL BE USED AS THE BASIS FOR DEVELOPMENT.

EPITAXX INC
3490 U.S. RTE 1
PRINCTON, NJ 08540
Program Manager: DR GREGORY H OLSEN
Contract #:
Title: HIGH EFFICIENCY COMPOUND SEMICONDUCTOR ALLOYS FOR THERMOELECTRIC COOLING APPLICATIONS
Topic #: N90-135 Office: NAVSEA ID #: 41232

THE OBJECTIVE OF THIS PROGRAM IS THE DEVELOPMENT OF A MATERIALS PROCESS TECHNOLOGY WHICH WILL RELIABLY PROVIDE A HIGH YIELD OF MATERIALS FOR CONSTRUCTING PELTIER THERMO-ELEMENTS WITHA HIGH MATERIALS FIGURE OF MERIT OVER THE TEMPERATURE RANGE 250-350K. THE STUDY,, IN COOPERATION WITH THE UNIVERSITY OF VIRGINIA, WILL FOCUS ON THE MATERIALS SYSTEM CONSISTING OF (Bi, Sb)2(Te, Se)3 ALLOYS FOR BOTH p- AND n-TYPE THERMOELEMENTS FOR TWO REASONS: (1) THE LITERATURE SHOWS THAT SPECIFIC COMPOSITIONS IN THIS ALLOY SYSTEM HAVE PROVIDED EXCEPTIONALLY HIGH FIGURES OF MERIT (3.2-3.4 x 10-3/K DEG AT 300K) AND A MAXIMUM PELTIER FOOLING OF 77 DEG K; AND (2) INVESTIGATORS AT THE UNIVERSITY OF VIRGINIA HAVE RECENTLY OBTAINED THE HIGHEST REPORTED FIGURE OF MERIT OF 3.7 x 10-3/DEG K FOR A p-TYPE (Bi, Sb)2(Te, Sb)3 ALLOY. BASED ON THE UNIVERSITY OF VIRGINIA RESULTS, THE PROCESS SELECTED FOR FABRICATING THESE ALLOYS WILL INVOLVE A COMBINATION OF RF INDUCTION MELTING AND HORIZONTALL BRIDGMAN GROWTH IN ORDER TO ACHIEVE HIGH CHEMICAL HOMOGENEITY AND MINIMUM INTERNAL STRAINS. SUCH MATERIAL SHOULD EXHIBIT A HIGHER CHARGE CARRIER MOBILITY AND HENCE AN IMPROVEMENT IN THE ELECTRICAL COMPONENT TO THE FIGURE OF MERIT.

HI-Z TECHNOLOGY INC
11180 ROSELLE ST - STE G
SAN DIEGO, CA 92121
Program Manager: NORBERT B ELSNER
Contract #:
Title: THERMOELECTRIC ALLOYS WITH A Z > 3.5 x 10 -3/K DEG
Topic #: N90-135 Office: NSSC ID #: 41233

THE (Bi, Sb)2(Se, Te)3 FAMILY OF ALLOYS HAVE VALUES REPORTED IN THE LITERATURE AS HIGH AS 3.2 x 10-3/K DEG FOR THE N TYPE AND 3.4 x 10-3/K DEG FOR THE P TYPE. WHILE THESE VALUES COULD BE HIGH BY APPROXIMATELY 10%, IT APPEARS THAT THROUGH VARIOUS CONTROLLED PROCESSES, Z VALUES GREATER THAN 3.5 x 10-3/K DEG CAN BE ACHIEVED.

THERMONICS INC
BOX 647D - RTE #2
SUTTONS BAY, MI 49682
Program Manager: RICHARD J BUIST
Contract #:
Title: HIGH EFFICIENCY THERMOELECTRIC MATERIAL
Topic #: N90-135 Office: NSSC ID #: 41234

A THERMOELECTRIC (TE) COOLING DEVICE WILL BE FABRICATED AND TESTED TO DEMONSTRATE A COOLING PERFORMANCE CONSISTENT WITH A FIGURE OF MERIT, Z = 3.5 X 10 -3 K DEG -1. THE PROPOSED METHOD WILL BE TO CAPITALIZE ON THE THERMMODYNAMICS RELATED TO THE THOMSON COOLING EFFECT. THE THOMSON EFFECT PRODUCES COOLING IN ADDITION TO THE PELTIER EFFECT BY VIRTUE OF VARIANCE OF THE SEEBECK COEFFICIENT IN AN OPERATING TE PELLET RESULTING FROM THE TEMPERATURE GRADIENT. THIS EFFECT IS REFERRED TO AS AN "INTRINSIC" EFFECT SINCE IT IS BROUGHT ON BY THE NATURAL CONSEQUENCES OF OPERATION. THE THOMSON EFFECT IS USUALLY IGNORED OR OVERLOOKED BY RESEARCHERS BUT IS CAPABLE OF BEING EXPLOITED TO ACHIEVE THIS PROGRAM'S OBJECTIVES. OUR UNIQUE APPROACH WILL BE TO PRODUCE A SIMILAR, ADDITIONAL COOLING EFFECT BY CREATING AN EXTRINSIC VARIANCE IN SEEBECK COEFFICIENT IN THE TE PELLETS. THIS WILL BE ACCOMPLISHED BY USING TWO SEGMENTS OF DIFFERENT SEEBECK COEFFICIENT FOR EACH LEG OF THE COUPLE. THIS DISTRIBUTED PELTIER COUPLE WILL PRODUCE SIGNIFICANTLY ENHANCED COOLING PERFORMANCE IN EXCESS OF HOMOGENEOUS TE MATERIALS WITH Z > 3.5 x 10 -3 DEG K -1, EVEN THOUGH THE INDIVIDUAL TE MATERIAL SEGMENTS CAN BE AS LOW AS 2.4 x 10 -3 DEG K -1! THEREFORE, THIS APPROACH HAS THE DISTINCT ADVANTAGE OF EXTREMELY HIGH SUCCESS PROBABILITY OVER CONVENTIONAL METHODS.

GEO-CENTERS INC
7 WELLS AVE
NEWTON CENTRE, MA 02159
Program Manager: BRUCE N NELSON
Contract #:
Title: FIBER OPTIC VOLTAGE SENSOR FOR NAVAL SHIPBOARD MONITORING APPLICATIONS
Topic #: N90-136 Office: NSSC ID #: 41235

FIBER OPTIC ELECTRIC FIELD AND VOLTAGE SENSING SYSTEMS TO SUPPORT NAVAL SHIPBOARD MONITORING, CONTROL, ELECTRICAL DISTRIBUTION, AND PROPULSION SYSTEM MEASUREMENT REQUIREMENTS WILL BE DEVELOPED IN THE PROPOSED PROGRAM. THESE SENSORS OFFER SIGNIFICANT COST AND PERFORMANCE ADVANTAGES TO NAVY MEASUREMENT REQUIREMENTS. THESE ADVANTAGES INCLUDE OPTICAL ISOLATION OF HIGH VOLTAGES FROM PERSONNEL AND DATA RECORDING INSTRUMENTATION, THE POTENTIAL FOR LOWER COST, HIGHER ACCURACY INSTRUMENTATION, AND IMMUNITY TO THE EFFECTS ELECTROMAGNETIC INTERFERENCE (EMI) AND ELECTROMAGNETIC PULSE

(EMP). THE TECHNICAL OBJECTIVE OF THE PHASE I PROGRAM IS THE DEVELOPMENT AND FIELD DEMONSTRATION OF A FIBER OPTIC VOLTAGE MEASUREMENT SYSTEM FOR SHIPBOARD USE.

PHYSICAL OPTICS CORP
2545 W 237TH ST - STE B
TORRANCE, CA 90505
Program Manager: DR BEHZAD MOSLEHI
Contract #:
Title: NOVEL FIBER OPTIC CURRENT/VOLTAGE SENSORS FOR SHIPBOARD APPLICATIONS
Topic #: N90-136 Office: NSSC ID #: 41261

PHYSICAL OPTICS CORPORATION (POC) PROPOSES TO DEVELOP AND DEMONSTRATE AN IN-LINE FIBER OPTIC VOLTAGE SENSOR THAT MODULATES THE INTENSITY OF THE LIGHT IN A SINGLE-MODE OPTICAL FIBER, VIA A SMALL RUGGED DEVICE THAT IS INTEGRAL TO THE FIBER. THIS ALREADY-PROVEN INTRINSIC FIBER OPTIC SENSOR DESIGN UTILIZES SURFACE PLASMON POLARITON(SPPs), TWO-DIMENSIONAL ELECTROGMAGNETIC WAVES GENERATED AT A METAL-GLASS BOUNDARY BY TAKING ENERGY FROM COHERENT POLARIZED EVANESCENT FIELDS, WHICH OCCUR IN THE CLADDING OF AN OPTICAL FIBER. FOR FABRICATION, THE OUTSIDE OF A SLIGHTLY BENT OPTICAL FIBER IS POLISHED TO A SMALL FLAT REGION, ON WHICH A VERY THIN ((500 ATOMIC LAYERS) METAL FILM IS VACUUM DEPOSITED. THIS CHOICE OF METAL MAY BE IRON FOR A CURRENT SENSOR OR SILVER FOR A VOLTAGE SENSOR. TAILORING OF THE SENSOR RESPONSE FOR A DESIRED OPERATING RANGE IS DONE BY VARYING THE FILM THICKNESS AND ITS LOCATION RELATIVE TO THE FIBER CORE. THERE IS NO CUTTING, SPLICING, OR ANY OTHER FIBER INTERRUPTION INVOLVED. THESE ACCURATE FIBER OPTIC SENSOR DESIGNS HAVE GOOD POTENTIAL TO BE LOW-COST, RUGGED, AND VERSATILE.

HLA ENGINEERS INC
4633 N CENTRAL EXPWY - STE 306
DALLAS, TX 75205
Program Manager: ROBERT H FINNEY
Contract #:
Title: COMPOSITE FLEXIBLE PIPE COUPLING FOR SURFACE SHIPS
Topic #: N90-137 Office: NSSC ID #: 41236

EXPLORATORY DEVELOPMENT OF A FLEXIBLE PIPE CONNECTION, SIMILAR TO THE CURRENTLY USED RUBBER INSERT SOUND ISOLATION COUPLING, USING FIBER REINFORCED RESIN MATERIALS AND ELASTOMER IS PROPOSED. THIS EFFORT WILL BE DIRECTED TOWARDS THE DEVELOPMENT OF COUPLINGS FOR USE IN THE CONTROLLABLE PITCH PROPELLER HYDRAULIC PIPING AND THE PRAIRIE MASKING PIPING ON SURFACE SHIPS. THE DESIGN OF THE COUPLING UTILIZES THE KNOWLEDGE OBTAINED FROM THE DESIGN OF THE COUPLINGS USED ON RUBBER INSERT SOUND ISOLATION COUPLINGS, HELICOPTER ELASTOMERIC BEARINGS, AND LAMINATED ELASTOMERIC JOINTS USED IN DRILLING PLATFORM RETENTION SYSTEMS. PRIOR R&D ON COMPOSITE/ ELASTOMERIC BEARINGS AND COMPOSITE ROTOR BLADES WILL BE UTILIZED IN THE COMPOSITE DESIGN.

DYNAFLOW INC
7210 PINDELL SCHOOL RD - SCIENCE BLDG
LAUREL, MD 20707
Program Manager: GEORGES L CHAHINE
Contract #:
Title: PROPELLER TIP CAVITATION SUPPRESSION USING SELECTIVE INTERMITTENT POLYMER INJECTIONS
Topic #: N90-138 Office: NSSC ID #: 41237

WITH RECENT ADVANCES IN ACOUSTIC DETECTION TECHNIQUES, QUIETING OF SHIP PROPELLERS IS ESSENTIAL. WE PROPOSE HERE TO DELAY TIP VORTEX CAVITATION BY INJECTION OF LONG CHAIN DRAG REDUCING POLYMERS IN THE TIP VORTEX CORE AND THUS REDUCING THE TIP VORTEX INDUCED CAVITATION NOISE. FOR THIS TO BE EFFECTIVE, WITHOUT ANY DRAWBACKS ON PROPELLER PERFORMANCE, THE INJECTION HAS TO BE SELECTIVE: THE POLYMERS HAVE TO BE INTRODUCED ONLY IN THE VISCOUS CORE OF THE TIP VORTEX. THE INJECTION HAS ALSO TO BE ON AN AS NEEDED BASIS TO MINIMIZE POLYMER SOLUTION CONSUMPTION, AND TRANSPORT CONSTRAINTS ON THE VESSEL. THESE TWO OBJECTIVES COULD BE ACHIEVED IF THE INJECTION PORTS ARE WELL LOCATED ON THE BLADES AND IF A FEED BACK MECHANISM IS ESTABLISHED BETWEEN THE PROPELLER FLOW FIELD AND THE POLYMER SOLUTION INJECTION. WE PROPOSE TO INVESTIGATE THE FEASIBILITY OF THIS CONCEPT IN THE PHASE I EFFORT OF THIS PROPOSED RESEARCH PROGRAM. AN ACTUAL MODEL SCALE PROPELLER DESIGNED FOR A NAVY VESSEL WILL BE USED. ITS CHARACTERISTICS AND ITS CAVITATION INCEPTION CURVES WILL BE ESTABLISHED FOR A BASELINE. THEN THE PROPELLER WILL BE MODIFIED BY FITTING TWO OF ITS BLADES WITH FLUID INJECTION PORTS WHOSE POSITION WILL BE DETERMINED FROM THE VISUALIZATION OF THE FLOW AROUND THE UNMODIFIED PROPELLER. VARIOUS CONCENTRATIONS OF POLYMER SOLUTION INJECTIONS WILL THEN BE PERFORMED AND MODIFICATION OF THE CAVITATION INCEPTION CHARACTERISTICS SOUGHT. THE RESULTS WILL BE COMPARED WITH THE BASELINE TESTS AS WELL AS WITH PURE WATER AND WATER/GLYCERINE SOLUTION INJECTION IN THE SAME AMOUNTS. AS A RESULT, CRITERIA AND A PROCEDURE FOR PROPELLER DESIGN TO DELAY TIP VORTEX CAVITATION INCEPTION WILL BE ESTABLISHED. THESE WOULD BE REFINED IN PHASE II OF THE PROPOSED EFFORT.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
Program Manager: JACK WOODS
Contract #:
Title: NOVEL COMPOSITE STRUCTURES FOR SHIPBOARD FIRE BARRIER APPLICATIONS
Topic #: N90-139 Office: NSSC ID #: 41238

THE NAVY'S DESIRE TO WITHSTAND PROJECTILE IMPACT AND DELAY THE SPREAD OF FIRES ABOARD SHIP CAN BE SATISFIED WITH NOVEL, LIGHTWEIGHT APPROACHES TO SHIP BULKHEAD STRUCTURES. THIS PHASE I PROGRAM INVESTIGATES NOVEL CONCEPTS WHICH COMBINE THE FIRE BARRIER, BALLISTIC PROTECTION, AND STRUCTURAL PERFORMANCE OF SHIP BULKHEADS. THE FIRE BARRIER ASPECT IS ADDRESSED BY DEVELOPING A MATRIX RESIN WITH INTUMESCENT BEHAVIOR AND DESIGNING AN INSULATING SANDWICH PANEL CORE. BALLISTIC PROTECTION IS PROVIDED BY INCORPORATING A HARD ARMOR IN A SANDWICH PANEL FACESHEET AND USING THE CORE AS A SOFT ARMOR. SEVERAL CORE CONCEPTS ARE PROPOSED WHICH COMBINE THE BALLISTIC PERFORMANCE OF MULTILAYER GLASS WOVENS WITH THE INSULATING VALUE OF HIGH TEMPERATURE FOAM CORES. NOVEL CONCEPTS ARE PROPOSED TO PROVIDE STRUCTURAL INTERCONNECTION OF THE FACESHEETS AND PRODUCE SANDWICH PANELS WITH EXCELLENT STRUCTURE PROPERTIES. FOSTER-MILLER WILL STUDY THE PROPOSED APPROACHES IN PHASE I BY SIMPLE MECHANICAL, FIRE BARRIER, AND BALLISTIC TESTS TO DETERMINE THE MOST PROMISING APPROACHES. THESE TEST RESULTS WILL BE COMPARED TO EACH OTHER AND TO SIMILAR RESULTS ON STANDARD GLASS/PHENOLIC NOMEX CORE, STAINLESS STELL, AND OTHER AVAILABLE SHIP BULKHEAD PANELS. THE BEST CANDIDATES FROM THESE INITIAL PHASE I SCREENINGS WILL BE SELECTED FOR EXPANDED COUPON TESTS AND FULL-SCALE FABRICATION/TEST PROGRAMS IN PHASE II.

ORINCON CORP
9363 TOWNE CENTRE DR
SAN DIEGO, CA 92121
Program Manager: DR ROBERT N LOBBIA
Contract #:

Title: REALIZING THE POTENTIAL OF TOTAL PLATFORM SENSOR DATA FUSION
Topic #: N90-140 Office: NSSC ID #: 41239

TOTAL PLATFORM SENSOR DATA FUSION CONCEPTS CAN YIELD PERFORMANCE GAINS TO SHIPBOARD AIR DEFENSE SYSTEMS THAT MITIGATE THE PERFORMANCE ENHANCEMENTS FOR EXISTING AND PROJECTED ANTI-SHIP MISSILE AND AIRCRAFT THREATS. THE PERFORMANCE GAINS IN FUSION ARE IN ITS ABILITY TO PROVIDE A CONCISE, ACCURATE, AND TIMELY TACTICAL TARGET SCENE. THE ESSENCE OF THE DESIGN APPROACH IS TO PROCESS ALL OF THE INFORMATION GENERATED BY EACH OF THE SENSOR SYSTEMS (KINEMATIC AS WELL AS TARGET ATTRIBUTES) TO BUILD SINGLE- OR MULTIPLE-HYPOTHESIS TACTICAL SCENES IN REAL TIME USING RULE-BASED INFERENCE AND CLASSIFICATION PRODUCT OUTPUTS TO CONTROL THE COMPUTATIONAL REQUIREMENTS, AND TO OPTIMIZE THE HYPOTHESIS SELECTION PROCESS FOR TIMELY PRESENTATION TO THE TACTICAL OPERATOR. PHASE I OF THIS EFFORT WILL BE A COMPLETE CHARACTERIZATION OF THE APPROPRIATE SENSOR SYSTEMS THAT FEED INTO THE CORRELATION AND FUSION ALGORITHMS. THE CHARACTERIZATION OF THE APPROPRIATE SENSOR SYSTEMS THAT FEED INTO THE CORRELATION AND FUSION ALGORITHMS. THE CHARACTERIZATION WILL LEAD TO A SET OF COMPUTER MODELS THAT RELATE THE SENSOR OBSERVABLES TO THE TARGET STATE. THE COORDINATE TRANSFORMATIONS BETWEEN SENSOR AND TARGET COORDINATES, THE NONLINEAR MATHEMATICAL EQUATIONS RELATING THE TWO SETS OF COORDINATES, THE STATISTICAL PROPERTIES OF SENSOR NOISE, CLUTTER, AND FALSE ALARM SPECIFICATION, AND SENSOR DEGRADATION DUE TO ADVERSE WEATHER AND TARGET JAMMING CHARACTERISTICS WILL ALL BE DEFINED AS PART OF THIS PHASE I EFFORT.

PHYSICAL OPTICS CORP
2545 W 237TH ST - STE B
TORRANCE, CA 90505
Program Manager: DR BEHZAD MOSLEHI
Contract #:
Title: WAVELENGTH DISTRIBUTED DATA INTERFACE FOR SHIPBOARD COMPARTMENT AREA NETWORKS
Topic #: N90-141 Office: NSSC ID #: 41240

THE REQUIREMENTS OF THE NAVY FOR ITS NEXT GENERATION HIGH SPEED DATA TRANSPORT NETWORKS ARE RAPIDLY OUTSTRIPPING THE CAPABILITIES OF COAXIAL CABLES. FIBER OPTICS INHERENT ADVANTAGES ENABLE NEW NETWORK CONFIGURATIONS TO INTEGRATE MIXED MEDIA (VOICE, VIDEO, DATA, ETC.) WITH VARYING DATA RATES (Kbits/s TO Gbits/s) INTO A SINGLE NETWORK. IN ADDITION, WAVELENGTH DIVISION MULTIPLEXING (WDM) GIVES FUTURE EXPANDABILITY AND ADDED FEATURES SUCH AS ON-LINE NETWORK TESTING AND DATA SELECTION, SECURITY, AND SELECTIVITY. POC PROPOSES TO DEVELOP A COMPARTMENT AREA NETWORK (CAN) THAT IS BOTH COST EFFECTIVE AND MEETS THE PRESENT NEEDS OF THE NAVY. POC'S CONCEPT IS BASED ON COMBINING THE BEST ATTRIBUTES OF BOTH WDM AND SAFENET/FDDI INTO A UNIQUE NETWORK REFERRED TO AS WAVELENGTH DISTRIBUTED DATA INTERFACE (WDDI). EDM WILL BE UTILIZED TO INCREASE THE NETWORK PERFORMANCE AS THE REQUIREMENTS GROW WITHOUT MAKING COMPLEX CHANGES TO EXISTING NETWORK HARDWARE OR SOFTWARE. THIS IS ACCOMPLISHED BY COMBINING MANY OPTICAL INFORMATION CARRIERS ONTO A SINGLE FIBER IN A LOW LOSS MANNER. AN EXPLORATORY EIGHT-CHANNEL SINGLE-MODE WDDI SYSTEM WILL BE BUILT AND EVALUATED TO DEMONSTRATE THE FEASIBILITY OF THE CONCEPT AND ITS CAPABILITY FOR MIXED MEDIA, MIXED SOURCES, AND MIXED DATA RATES INFORMATION TRANSPORT.

ADVANCED MATERIAL SYSTEMS INC
230 WEST HALL - STE 201
SLIDELL, LA 70460
Program Manager: MATTHEW T LIU
Contract #:
Title: ICE PHOBIC COATINGS FOR SHIP ANTENNA APPLICATIONS

Topic #: N90-142 Office: NSSC ID #: 41241

U.S. NAVY SURFACE SHIPS OPERATING IN THE ARCTIC REGIONS AND NORTH ATLANTIC EXPERIENCE ICING PROBLEMS WITH TOPSIDE SYSTEMS INCLUDING ANTENNAS FOR RADAR AND COMMUNICATIONS. ICE ACCRETION/FORMATION ON THE ANTENNA WILL DECREASE ITS TRANSMISSION EFFICIENCY OF THE RADIO FREQUENCY (R.F.) ENERGY. A DIELECTRIC PLANT WITH BUILD-IN ICEPHOBICITY IS NEEDED TO PROTECT THE ANTENNA. HOWEVER, NO SURFACE COATING WILL PREVENT ICE FORMATION ON A COLD SUBSTRATE SURFACE AT FREEZING ENVIRONMENTAL CONDITIONS. THIS PAPER PRESENTS TECHNICAL APPROACHES TAKEN IN THE DEVELOPMENT OF A COATING MATERIAL THAT IS R.F. TRANSPARENT AND WILL RETARD ICE ACCRETION. THE PAPER DEFINES COATING MATERIAL PROPERTY REQUIREMENTS AND MATERIAL SELECTION CRITERIA. COATING SYSTEM FORMULATION AND PROCESS ARE BEING DISCUSSED. THE PAPER ALSO ADDRESSES PROOF-OF-CONCEPT TESTS AND FUTURE RESEARCH AND DEVELOPMENT EFFORTS IN OPTIMIZING THE COATING SYSTEM FROM PERFORMANCE AND COST STAND POINT.

GUMBS ASSOCS INC
11 HARTS LN
EAST BRUNSWICK, NJ 08816
Program Manager: DR PRASANNA C SEKHAR
Contract #:
Title: SOLUBLE CONDUCTING POLYMERS FOR EMI SHIELDING COMPOSITES
Topic #: N90-143 Office: NSSC ID #: 41242

ADDRESSING THE NEED FOR LIGHT-WEIGHT CORROSION RESISTANT MATERIALS FOR EMI SHIELDING, THE NOVEL TECHNOLOGY PROPOSED HEREIN UTILIZES SOLUBLE CONDUCTING (SEMICONDUCTING) POLYMERS DEVELOPED IN GUMB'S LABORATORIES FOR UNRELATED APPLICATIONS. THESE POLYMERS HAVE 6% W/W OR HIGHER SOLUBILITY IN ORGANIC SOLVENTS AND BULK CONDUCTIVITIES AS HIGH AS 2,000 S/cm (DATA PRESENTED HEREIN). STABILITY, DURABILITY (INCLUDING WATER-REPELLENCY) AND NON-CORROSIVE NATURE OF THE POLYMERS ARE ALREADY PROVEN. SINCE EXTENSIVE WORK IN OTHER LABS HAS SHOWN THAT EMI SHIELDING EFFECTIVENESS (SE) IS DIRECTLY RELATED TO CONDUCTIVITY AND 1 S/cm CONDUCTIVITY MATERIALS CAN PROVIDE 30 dB OR MORE OF SE IN THE 1 - 100 MHz RANGE, THE PROPOSED TECHNOLOGY WILL EASILY MEET THE TARGETED 60 dB SE. THE PROPOSED WORK SEEKS FIRSTLY TO TEST ALREADY SYNTHESIZED SOLUBLE POLYMERS AS THE MATRIX COMPONENT IN COMPOSITES WITH FILLERS SUCH AS GRAPHITE CLOTH, GRAPHITE FIBER, CARBON BLACK OR METAL-COATED GLASS FIBER, FOR EMI SE IN ACCORDANCE WITH ASTM ES 7-83, MIL-STD-462 AND RELATED SPECIFICATIONS AT 10 KHz - 1 GHz IN NEAR AND FAR FIELD ESTIMATIONS. THE POLYMER'S SOLUBILITY RENDERS COMPOSITE FABRICATION FACILE. THE WORK WILL ALSO SEEK TO IMPROVE CONDUCTIVITY, SOLUBILITY AND STABILITY OF THE POLYMERS FURTHER, AND SELECTED ADDITIONAL NOVEL POLYMERS WILL BE SYNTHESIZED. ADVANTAGES OF THE TECHNOLOGY INCLUDE LIGHT WEIGHT, NON-CORROSIVENESS, LOW COST, HIGH AND CONTROLLABLE CONDUCTIVITY, AND FABRICATION INTO COMPLEX SHAPES.

SYSTEM PLANNING CORP
1500 WILSON BLVD
ARLINGTON, VA 22209
Program Manager: F E BISHOP JR
Contract #:
Title: ULTRA-WIDEBAND MODULAR SOLID-STATE TRANSMITTER ARRAY FOR NAVAL ELECTRONIC WARFARE
Topic #: N90-145 Office: NSSC ID #: 41243

A NOVEL APPROACH TO PROVIDING ULTRA-WIDEBAND ACTIVE MMIC ARRAYS IS PROPOSED, APPLICABLE TO NAVAL AIRBORNE, SHIPBOARD, AND EXPENDABLE EW SYSTEMS. IT WILL PROVIDE COMPLEMENTARY ARRAY AND BEAM FORMING CONCEPTS FOR THE 2 TO 20 GHz EW ARRAY MODULES THAT WILL EVOLVE FROM THE DoD MIMIC PROGRAM IN THE EARLY 1990s. THREE BASIC CONCEPTS WILL BE EXPLORED: (a)

NOVEL ULTRA-WIDEBAND ARRAY ELEMENTS; (b) ULTRA- WIDEBAND ARRAYING BASED ON COMPACTING MULTIPLE CLOSELY SPACED ELEMENTS WITH PHASE AND AMPLITUDE CENTERS APPROPRIATE TO THE OPERATING FREQUENCY, AND (c) THE BEAMFORMING OF "n" ELEMENTS, TAKEN "m" AT A TIME, USING FREQUENCY INDEPENDENT COARSE AND FINE LENSES TO DEED THE COMPACTED ARRAY. PHASE I WOULD CONCLUDE WITH PROOF-OF- PRINCIPLE ANALYSES AND FEASIBILITY MODELS ALONG WITH A FINAL REPORT RECOMMENDING A DESIGN FOR FABRICATION AND TEST DURING PHASE II.

SPECTRUM MANAGEMENT GP INC
3211 JERMANTOWN RD - STE 401
FAIRFAX, VA 22030
Program Manager: DR NICHOLAS LAWRENCE
Contract #:
Title: VOICE RECOGNITION TECHNOLOGY APPLIED TO MULTIPLE SOI RECOGNITION
Topic #: N90-146 Office: NSSC ID #: 41244

OUR FIRM GAINED EXPERIENCE IS CHARACTERIZING AND CLASSIFYING VOICE INPUT IN RECENT SBIR PROJECTS. THE TECHNOLOGY WE DEMONSTRATED APPEARS TO US TO BE ADAPTABLE TO THE DESCRIBED MULTIPLE SOI RECOGNITION PROBLEM. WE PROPOSE IN THIS PROJECT TO DO THE INITIAL DEVELOPMENT AND BUILD A DEMONSTRATION.

ENERGY COMPRESSION RESEARCH CORP
910 CAMINO DEL MAR - STE A
DEL MAR, CA 92014
Program Manager: OVED S F ZUCKER
Contract #:
Title: HIGH POWER SHORT PULSE JAMMERS
Topic #: N90-148 Office: NSSC ID #: 41245

THE OBJECT OF THE PHASE I EFFORT IS TO STUDY THE USE OF HIGH POWER SOLID STATE PHOTOCONDUCTIVE SWITCHES FOR USE IN HIGH POWER MICROWAVE JAMMER SYSTEMS. THE STUDY IS TO ADDRESS THE PROBLEM OF DISRUPTING ANTI-SHIP MISSILE GUIDANCE SYSTEMS. A SECOND GOAL IS TO STUDY THE USE OF THE POWER SOURCE IN ULTRA WIDE BAND RADAR SYSTEMS. PHOTOCONDUCTIVE SEMICONDUCTOR SWITCHES PRODUCED BY ENERGY COMPRESSION RESEARCH HAVE BEEN DEMONSTRATED TO BE CAPBLE OF SWITCHING EXTREMELY HIGH POWER WITH NANOSECONDS OF RISETIME. GROUPS OF THESE DEVICES OPERATING IN UNISON CAN PRODUCE THE GIGAWATT POWER LEVELS REQUIRED FOR THE JAMMING FUNCTION. THE SYSTEM COMPONENTS REQUIRED TO MEET THE JAMMING MISSION WILL BE STUDIED. THESE WILL INCLUDE THE PHOTOCONDUCTIVE SWITCHES, THE ENERGY STORAGE SYSTEM, TRANSFORMER AND THE ANTENNA. THE PERFORMANCE WILL BE CALCULATED AS A FUNCTION OF RANGE AND THE SIZE, WEIGHT AND COST WILL BE ESTIMATED. A PLAN WILL BE DRAWN UP TO CONSTRUCT AND TEST A DEMONSTRATION TRANSMITTER.

OPHIR CORP
3190 S WADSWORTH BLVD - STE 100
LAKEWOOD, CO 80227
Program Manager: DR LOREN D NELSON
Contract #:
Title: A MILLIMETER WAVE PASSIVE RADIOMETER TO DETECT TARGETS AT SEA
Topic #: N90-149 Office: NSSC ID #: 41246

WE PROPOSE A PASSIVE MULTI-CHANNEL MILLIMETER-WAVE RADIOMETER FOR DETECTING METAL OBJECTS AGAINST THE SEA-SURFACE BACKGROUND, EVEN THOUGH THE TARGET IS TOO SMALL TO BE

BEAMFILLING. THE PROPOSED "FREQUENCY-TRANSFORMATION" DETECTION TECHNIQUE WILL UTILIZE MULTIPLE PASSIVE CHANNELS AT 23, 31,, AND 94 GHz. THIS RADIOMETER DEVELOPMENT TO DETECT TARGETS AT SEA IS A LOGICAL EXTENSION OF OUR ALREADY DEVELOPED AND COMMERCIALLY AVAILABLE 23/31 GHz WATER VAPOR RADIOMETER. THE PROPOSED RADIOMETER, UNLIKE CONVENTIONAL RADAR, IS PASSIVE AND THUS DOES NOT REVEAL ITS LOCATION BY GIVING OFF ANY ACTIVE RADIATION. IT WOULD BE EXTREMELY DIFFICULT TO ACTIVELY JAM SINCE IT DETECTS THE RELATIVE ABSENCE OF NATURAL THERMAL MICROWAVE ENERGY CAUSED BY SKY REFLECTIONS OFF METAL TARGETS. ANY ACTIVE JAMMER COULD ITSELF BE TARGETED VIA ITS EMISSION, AND WOULD HAVE TO SIMULATE A WIDE AREA DIFFUSE SOURCE FROM A POINT TRANSMITTER.

SO-HA-R INC
1040 S LA JOLLA AVE
LOS ANGELES, CA 90035
Program Manager: DR HERBERT HECHT
Contract #:
Title: EXPERT SYSTEM FOR TAILORING R/M/QA CLAUSES
Topic #: N90-150 Office: NSSC ID #: 41247

AN EXPERT SYSTEM WILL BE DEVELOPED FOR TAILORING RELIABILITY, MAINTAINABILITY, AND QUALITY ASSURANCE (R/M/QA) SPECIFICATION DOCUMENTS TO THE REQUIREMENTS OF INDIVIDUAL NAVY ACQUISITION DOCUMENTS. THE TAILORING TOOL WILL ENABLE A PROGRAM MANAGER OR ACQUISITION ENGINEER WHO IS NOT NECESSARILY AN R/M/QA SPECIALIST TO SELECT REQUIREMENTS CLAUSES THAT ARE APPROPRIATE AND COST-EFFECTIVE, USING AN IBM COMPATIBLE PERSONAL COMPUTER. HYPERTEXT CAPABILITY INTEGRATED WITH THE EXPERT SYSTEM WILL ALLOW THE USER TO RAPIDLY ACCESS PERTINENT SECTIONS OF STANDARDS, ACQUISITION GUIDES, AND OTHER DOCUMENTS. THE SYSTEM WILL BE DEVELOPED BY AN ORGANIZATION SPECIALIZING IN R/M/QA AS WELL AS BEING A DEVELOPER OF EXPERT SYSTEM APPLICATIONS. IT WILL BE VALIDATED BY A DISTINGUISHED INDEPENDENT DOMAIN EXPERT WITH MORE THAN 30 YEARS OF EXPERIENCE. AUTOMATED TECHNIQUES WILL BE INVESTIGATED FOR CONVERTING R/M/QA TAILORING KNOWLEDGE REPRESENTED IN AN EASILY VALIDATED AND MAINTAINED SPREADSHEET FORMAT DIRECTLY INTO KNOWLEDGE BASE RULES.

AMHERST SYSTEMS INC
30 WILSON RD
BUFFALO, NY 14221
Program Manager: DR EDWARD G EBERL
Contract #:
Title: TESTING OF SHIPBOARD EW EQUIPMENT
Topic #: N90-151 Office: NSSC ID #: 41248

AN ELECTRONIC WARFARE VERIFICATION TEST SET (EWVTS) IS DESCRIBED WHICH CAN BE USED TO QUICKLY AND RELIABLY VERIFY THE OPERATION OF SHIPBOARD ECM AND ESM SYSTEMS. THE EWVTS IS COMPRISED OF THE FOLLOWING MAJOR ELEMENTS: (a) SIGNAL GENERATION SUBSYSTEM, (b) HIGH POWER AMPLIFIER, (c) ANTENNA WITH PEDESTAL AND FEED, (d) SIGNAL MEASUREMENT SYSTEM, (e) CONTROL, AND (f) CALIBRATION SYSTEM. THE EWVTS WILL BE ABLE TO GENERATE INTERLEAVED EMITTER SIGNALS AND MEASURE MULTIPLE ECM RESPONSES SIMULTANEOUSLY TO QUICKLY AND AUTOMATICALLY PERFORM A COMPREHENSIVE VERIFICATION PROCESS.

ADCOM SYSTEMS INC
30 GRANT ST
WALTHAM, MA 02154
Program Manager: DR ELIE J BAGHDADY
Contract #:

Title: PASSIVE RANGING WITH LIMITED DATA
Topic #: N90-152 Office: NSSC ID #: 41249

INNOVATIVE TECHNIQUES ARE PROPOSED FOR INVESTIGATION IN A PHASE I EFFORT TO DETERMINE PASSIVE RF SURVEILLANCE AND TARGETING SENSORS AND ASSOCIATED METHODOLOGY FOR PERFORMING RAPID AND ACCURATE MEASUREMENTS OF RANGE/LOCATION OF OTH THREAT RF EMITTERS. THE ESSENTIAL PHYSICAL CONSTRAINTS TO BE OBSERVED ARE SENSOR COMPATIBILITY WITH, AND PORTABILITY OF THE ASSOCIATED RANGE.DETERMINATION/ PROCESSING EQUIPMENT ON, A SUBMARINE PLATFORM. THE INNOVATIVE TECHNIQUES OUTLINED IN THIS PROPOSAL OFFER VERY PROMISING ALTERNATIVE OPTIONS FOR REALIZING PASSIVE RF RANGING SYSTEMS THAT SATISFY THESE CONSTRAINTS. THESE TECHNIQUES WILL BE EVALUATED ANALYTICALLY IN THE PROPOSED PHASE I EFFORT. DESIGN ANALYSES WILL BE PERFORMED TO DEFINE THE TRADEOFFS IN THE PRACTICAL IMPLEMENTATIONS WITHIN THE LIMITING ENVIRONMENT OF SUBMARINES, SUBJECT TO VARIABLE ATTITUDE, POSITION AND ASSOCIATED RATES AND OTHER SIGNIFICANT CONSIDERATIONS. DEFINITIVE SENSOR CONFIGURATIONS, SENSOR PROCESSING SCHEMES/TECHNIQUES, COMPUTATIONAL ALGORITHMS AND OPERATING MODALITIES WILL BE FIRMED UP, AND DESIGN AND IMPLEMENTATION LATITUDES WILL BE ESTABLISHED, COMPLETE WITH PERFORMANCE PREDICTIONS, AND A PLAN FOR PROOF-OF-METHOD EXPERIMENTS AND A HARDWARE DEVELOPMENT PROGRAM FOR PHASE II.

SYSTEMS CONTROL TECHNOLOGY INC (SCT)
2300 GENG RD
PALO ALTO, CA 94303
Program Manager: DR GREGORY D GIBBONS
Contract #:
Title: THE USE OF ARTIFICIAL INTELLIGENCE FOR TORPEDO DETECTION
Topic #: N90-153 Office: NSSC ID #: 41250

DESPITE THE FACT THAT TORPEDO ACOUSTIC SIGNATURES HAVE VERY SPECIFIC CHARACTERISTICS, IT HAS BEEN DIFFICULT TO DEVELOP AN AUTOMATED TORPEDO DETECTION SYSTEM WITH A HIGH PROBABILITY OF DETECTION AND AT THE SAME TIME A LOW PROBABILITY OF FALSE ALARM. SCT BELIEVES THAT BY ADAPTING THE SES: A SONAR EXPERT SYSTEM TO ACOUSTIC TORPEDO DATA, IT WILL BE POSSIBLE TO PERFORM RELIABLE AUTOMATIC TORPEDO DETECTION. THE BASIS OF SES IS TO EXTRACTION THE RIGHT FEATURES FROM THE ACOUSTIC DATA AND APPLY THE PROPER LOGICAL COMBINATIONS TO THOSE FEATURES TO PERFORM ACCURATE SIGNATURE INTERPREATION. CURRENTLY SES IS BEING APPLIED TO THE PROBLEM OF INTERPRETING RECORDED REAL DATA FROM THE SQR-19 SENSOR AND HAS BEEN SUCCESSFULLY DEMONSTRATED IN THE USE OF ARTIFICIAL INTELLIGENCE TECHNOLOGY TO PERFORM LINE ASSOCIATION AND SIGNATURE CLASSIFICATION. THE STEPS NECESSARY TO ADAPT SES TO THE PROBLEM OF TORPEDO DETECTION ARE TO DEFINE TORPEDO SIGNATURE CHARACTERISTICS, ENHANCE THE LOGIC IN SES TO ACCURATELY DISCRIMINATE THESE CHARACTERISTICS FROM OTHER ACOUSTIC SIGNALS, AND TO DEMONSTRATE THE CAPABILITY TO PROVIDE A CLEAR CUT DECISION ABOUT THE PRESENCE OF A TORPEDO IN PASSIVE ACOUSTIC DATA.

SYSTEMS CONTROL TECHNOLOGY INC (SCT)
2300 GENG RD
PALO ALTO, CA 94303
Program Manager: DR GREGORY D GIBBONS
Contract #:
Title: NEURAL NETWORKS FOR TORPEDO DETECTION
Topic #: N90-154 Office: NSSC ID #: 41251

SONAR OPERATORS CAN EASILY TELL WHEN A TORPEDO SIGNATURE APPEARS BY USING THE AVAILABLE VISUAL CHARACTERISTICS. DESPITE THE FACT THAT TORPEDO ACOUSTIC SIGNATURES HAVE VERY SPECIFIC CHARACTERISTICS, IT HAS BEEN DIFFICULT TO DEVELOP AN AUTOMATED TORPEDO DETECTION

SYSTEM WITH A HIGH PROBABILITY OF DETECTION AND AT THE SAME TIME A LOW PROBABILITY OF FALSE ALARM. NEURAL NETWORKS PROVIDE AN APPROPRIATE ARCHITECTURE FOR BUILDING SUCH A SYSTEM. BY DEVELOPING A SYSTEM THAT CAN EXTRACT THESE VISUAL FEATURES, SCT BELIEVES THAT IT IS POSSIBLE TO PERFORM TORPEDO DETECTION WITH GREATER RELIABILITY AND ACCURACY. THE BASIS OF NEURAL NETS FOR TORPEDO DETECTIONN (NN-TD) IS TO EXTRACT THE RIGHT FEATURES FROM THE ACOUSTIC DATA AND APPLY THE PROPER LOGICAL COMBINATIONS ON THOSE FEATURES TO PERFORM ACCURATE SIGNATURE INTERPRETATION. THE STEPS NECESSARY ARE TO REVIEW AND SELECT A NEURAL NETWORK DEVELOPMENT ENVIRONMENT, DEFINE TORPEDO SIGNATURE CHARACTERISTICS, SPECIFY THE FEATURES OF SPECTRAL DATA WHICH WILL BE USED TO SUPPORT TORPEDO DETECTION, DEVELOP A NEURAL NETWORK TO IDENTIFY AND QUANTIFY THESE FEATURES, AND DEMONSTRATE THE CAPABILITY TO PRIVIDE A CLEAR CUT DECISION ABOUT THE PRESENCE OF A TORPEDO IN PASSIVE ACOUSTIC DATA.

ARGOTEC INC
3750 HACIENDA BLVD
FT LAUDERDALE, FL 33312
Program Manager: BERNARD S WILLARD
Contract #:
Title: PRESET CAPABILITY FOR EXPENDABLE COUNTERMEASURE (CM) DEVICES
Topic #: N90-155 Office: NSSC ID #: 41153

TRANSMISSION OF DIGITAL DATA, SUCH AS A 64-BIT WORD, CAN BE ACCOMPLISHED RELIABLY BY ACOUSTIC TRANSDUCTION. WITHOUT PHYSICALLY ATTACHING A LINK OR MAKING A DESTRUCTIVE PENETRATION. A PROCESSED SIGNAL CAN BE TRANSMITTED ACOUSTICALLY THROUGH MULTI-LAYERED MEDIA OF DIFFERENT MOLECULAR DENSITY, SUCH AS HEAVY METAL, WATER, PLASTIC, AND AIR. BY ENGINEERING MEANS, ACOUSTIC SIGNAL POWER AND FREQUENCY CAN BE OPTIMIZED TO REDUCE THE EFFECT OF REVERBERATION WITHIN THE LAMINAR BOUNDARIES OF THE MEDIA AND THEREBY MAINTAIN SUFFICIENT SIGNAL CLARITY AND FIDELITY. THE USE OF ULTRA-SONIC ACOUSTIC DEVICES FOR NON-DISTRUCT TESTING AND FLAW DETECTION IN METALS HAS BEEN IN STANDARD PRACTICE FOR MANY YEARS. THE APPLICATION OF SMALL (LESS THAN 1 CUBIC INCH) ELECTROSTRICTIVE CERAMIC TRANSDUCERS IN THE ULTRA-SONIC ACOUSTIC REGION WITH HIGH Q COMBINED WITH OPTIMIZED SIGNAL PROCESSING IS PROPOSED TO SATISFY THE REQUIREMENT OF THIS SOLICITED TASK.

CAPE COD RESEARCH INC
PO BOX 600 - 95 MAIN ST
BUZZARDS BAY, MA 02532
Program Manager: MYLES WALSH
Contract #:
Title: HIGH-EFFICIENCY ELECTROCHEMICAL HOVERING SYSTEMS
Topic #: N90-157 Office: NSSC ID #: 41154

SEVERAL TYPES OF SUBMARINE-DEPLOYED EXPENDABLE DEVICES ARE REQUIRED TO REMAIN AT PRE-DETERMINED DEPTHS FOR PERIODS OF TIME UP TO ONE HOUR. THESE DEVICES RANGE IN SIZE FROM 3" DIAMETER BY 40" LENGTH TO 6.25" DIAMETER BY 106' LENGTH. THIS PHASE I RESEARCH EXPLORES THE FEASIBILITY OF DESIGNING HOVERING SYSTEMS BASED ON THE ELECTROCHEMICAL GENERATION OR CONSUMPTION OF GAS. THE ENERGY NEEDED COMES FROM A SEAWATER BATTERY.

TETRA CORP
4905 HAWKINS ST NE
ALBUQUERQUE, NM 87109

Program Manager: DR KENELL J TOURYAN
Contract #:
Title: A FERROFLUID PUMP HOVERING SYSTEM FOR UNDERWATER DEVICES
Topic #: N90-157 Office: NSSC ID #: 41155

THE USE OF AN ELECTROMAGNETICALLY DRIVEN FLUID THAT CAN COUPLE ENERGY TO SEA WATER CAN LEAD TO A QUIET AND RELIABLE MODE OF OPERATION FOR UNDERWATER DEVICES. THE WORK PROPOSED WILL CONSIST OF A LABORATORY DEMONSTRATION OF A FERROFLUID PUMP HOVERING SYSTEM FOR UNDERWATER DEVICES AND A CONCEPTUAL DESIGN OF A PROTOTYPE. THE ADVANTAGE OF THIS TYPE OF PROPULSION IS THAT ALMOST NO MOVING PARTS ARE REQUIRED AND THEREFORE, THE POTENTIAL EXISTS FOR A VERY QUIET MODE OF OPERATION. IT IS THE INTENT OF THIS PROPOSED PROGRAM TO CONDUCT A PROOF-OF-CONCEPT EXPERIMENT FOLLOWED BY A THOROUGH ANALYSIS, LABORATORY TESTS, DESIGN, FABRICATION, AND OPERATION OF A PROTOTYPE OF THE FERROFLUID PROPULSION SYSTEM IN PHASE I AND II THE OBJECTIVES OF THE PHASE I STUDY ARE TWO-FOLD: 1) TO CONDUCT LABORATORY SCALE EXPERIMENTS; AND 2) TO DEVELOP SIMPLIFIED THEORY AND DO SCALING ANALYSIS FOR DESIGNING A PROTOTYPE UNIT. A SUCCESSFUL PROPULSION SYSTEM THAT HAS VERY LOW ACOUSTIC SIGNATURE WILL BE A SIGNIFICANT ADVANCED IN THE STATE-OF-THE-ART OF HOVERING SYSTEMS IN AUTONOMOUS UNDERWATER VEHICLE.

HSE INC
1340 MOREHEAD
ANN ARBOR, MI 48103
Program Manager: DR JOHN SHEWCHUN
Contract #:
Title: INFRARED/MILLIMETER WAVE DETECTORS USING HIGH TEMPERATURE SUPERCONDUCTORS
Topic #: N90-158 Office: NSSC ID #: 40942

THIS PROPOSAL IS CONCERNED WITH THE DEVELOPMENT OF AN INFRARED/MILLIMETER WAVE DETECTOR USING THE BULK, NON-LINEAR CURRENT-VOLTAGE CHARACTERISTICS OF HIGH TEMPERATURE SUPERCONDUCTING THIN FILMS. SUCH DEVICES, WHICH ARE INFLUENCED BY INTERGRAIN WEAK LINKS, CAN CONVERT (RECTIFY), AND THEREFORE DETECT, HIGH FREQUENCY ELECTROMAGNETIC SIGNALS. THIS NON-BOLOMETRIC, BUT EXTREMELY BROADBAND RESPONSE, IS A FUNCTION OF TEMPERATURE AND BIAS CURRENT. THE EFFECT OF THE MORPHOLOGY OF THE FILM IS A FACTOR WHICH IS TO BE DETERMINED. ALSO, PARAMETERS SUCH AS SPECTRAL RESPONSE, DETECTIVITY AND NOISE EQUIVALENT POWER WILL BE ESTABLISHED SO AS TO CHARACTERIZE THE DEVICE. THE PRINCIPAL OBJECTIVE OF THIS WORK IS THE DEVELOPMENT OF A SENSITIVE BROADBAND, YET INEXPENSIVE, DETECTOR WHICH CAN BE USED AS A REPLACEMENT FOR NARROW BAND JUNCTION OR BARRIER-TYPE DEVICES.

SUPERCONDUCTIVE ELECTRONICS INC
11222 LA CIENEGA BLVD - STE 621
INGLEWOOD, CA 90304
Program Manager: MARK A JOHNSON
Contract #:
Title: LOW NOISE MICROWAVE RECEIVER
Topic #: N90-158 Office: NSSC ID #: 40943

FABRICATION OF A LOW-NOISE MICROWAVE RECEIVER USING HIGH TEMPERATURE SUPERCONDUCTORS DEPENDS UPON THE ABILITY TO FABRICATE INDIVIDUAL SUPERCONDUCTING MICROWAVE COMPONENTS, DETERMINATION OF THE OPTIMAL USAGE OF SUPERCONDUCTING COMPONENTS IN CONJUNCTION WITH CONVENTIONAL (NON SUPERCONDUCTING) ONES, AND SPECIFICATION OF A RESULTING DESIGN. SEI WILL DESIGN, FABRICATE, AND TEST AN EDGE-COUPLED FILTER AND LANGE COUPLER USING HIGH TEMPERATURE SUPERCONDUCTING THALLIUM-BASED THIN FILMS, AND WILL DETERMINE THE FEASIBILITY

AND APPROPRIATENESS OF USING HTS THIN FILMS FOR MIXER CIRCUITS. COMPLETION OF THESE ACTIVITIES WILL LAY THE GROUNDWORK OF COMPONENT DEVELOPMENT REQUIRED TO ASSEMBLE AND TEST A SIMPLE FUNCTIONAL LOW NOISE RECEIVER.

TAU CORP
485 ALBERTO WY
LOS GATOS, CA 95032
Program Manager: DR HASSAN MOSTAFAVI
Contract #:
Title: ELECTRONIC PRECISION FOCUSING FOR THE TYPE 18 PERISCOPE
Topic #: N90-165 Office: NSSC ID #: 41156

THE PROPOSED SYSTEM AUTOMATICALLY MEASURES THE LEVEL OF FOCUS IN A SUBREGION OF THE TYPE 18 PERISCOPE FIELD OF VIEW (FOV), AND USES A SEQUENCE OF FOCUS LEVEL MEASUREMENTS TO DRIVE A FOCUS CONTROLLER MECHANISM FOR AUTOMATIC AND PRECISE FOCUSING. THE SYSTEM USES DIGITAL PROCESSING OF A VIDEO CAMERA OUTPUT THAT IMAGES THE CENTER AREA OF THE FOV. THE FOCUS LEVEL IS THE FREQUENCY WEIGHTED RMS VALUE OF DIGITIZED VIDEO IMAGES, COMPUTED OVER AREAS OR OBJECTS OF INTEREST. THE REGION OF INTEREST IS FURTHER LIMITED TO SILHOUETTE EDGE OR TEXTURED PARTS OF AN IMAGE. WHILE ITERATING AT HIGH RATE, THE FOCUS CONTROLLER USES THE LAST SEQUENCE OF THREE FOCUS LEVEL MEASUREMENTS TO ESTIMATE A NEW POSITION FOR THE FOCUS STAGE DRIVE, RESULTING IN CONVERGENCE TO THE OPTIMUM FOCUS BY DITHERING THE FOCUS. THE FEASIBILITY OF THE CONCEPT IS DEMONSTRATED BY MEASURING THE FOCUS LEVEL SENSITIVITY TO RANGE DEVIATIONS. IT IS SHOWN THAT THE SYSTEM SENSITIVITY IS BETTER THAN THE HUMAN OBSERVER'S PERCEPTION OF BLUR WIDTH IN EDGES. TAU IMAGE PROCESSING LABORATORY WILL BE USED TO OPTIMIZE AND DEMONSTRATE THE ALGORITHMS USING THE ACTUAL PERISCOPE IMAGERY. THE PROPOSAL TASKS INCLUDE A PRELIMINARY DESIGN OF THE OPTICS, IMAGING FRONT END AND MECHANICAL INTERFACE TO THE PERISCOPE. THE DIGITAL PROCESSING SUBSYSTEM WILL ALSO BE DESIGNED FROM COMMERCIALLY AVAILABLE HARDWARE SUBSYSTEMS.

GINER INC
15 SPRING ST
WALTHAM, MA 02254
Program Manager: DR J A KOSEK
Contract #:
Title: A PULSE POWER SOURCE FOR SUBMARINE APPLICATIONS
Topic #: N90-166 Office: NSSC ID #: 41157

AN ADVANCED PROTON EXCHANGE MEMBRANE FUEL CELL SYSTEM IS PROPOSED TO PROVIDE PULSE POWER FOR A SUBMARINE ELECTROMAGNETIC LAUNCH SYSTEM. THE FUEL CELL SYSTEM, WHEN TOTALLY DEVELOPED, WILL PROVIDE 15,000 AMPERES AT 250 VDC (3,750 kW) FOR A PERIOD OF 1 SECOND. METHODS TO IMPROVE THE PERFORMANCE OF STATE-OF-THE-ART PROTON EXCHANGE MEMBRANE FUEL CELL SYSTEMS WILL BE INVESTIGATED. AREAS OF INVESTIGATION INCLUDE OPTIMIZED CATALYST, MEMBRANE, STACK CONFIGURATION AND OPERATING CONDITIONS.

LYNNTECH INC
RTE 5 - BOX 946A
COLLEGE STATION, TX 77840
Program Manager: OLIVER J MURPHY
Contract #:
Title: PULSE POWER SUPPLY FOR SUBMARINE ELECTROMAGNETIC LAUNCH
Topic #: N90-166 Office: NSSC ID #: 41158

A 250 V d>c>, 15 kA FUEL CELL CAPABLE OF 40 ONE-SECOND BURSTS OF ENERGY, WITH ABOUT 6.5 SECONDS BETWEEN BURSTS, OF 3.75 MW, IS PROPOSED AS A PULSE POWER SUPPLY FOR SUBMARINE ELECTROMAGNETIC LAUNCH. A PRELIMINARY ANALYSIS TAKING INTO ACCOUNT VARIOUS FUEL CELL OPERATING VOLTAGES AND EFFICIENCIES AND DIFFERENT METHODS OF FUEL AND OXIDANT STORAGE INDICATES THAT THERE IS NO ADVANTAGE FROM THE OVERALL VOLUME VIEW POINT TO WORKING AWAY FROM THE MAXIMUM POWER POTENTIAL OF THE FUEL CELL. THE ANALYSIS REFLECTS A SMALL SENSITIVITY TO VOLTAGE CHANGES CLOSE TO THE MAXIMUM POWER POINT, GAINS IN THE FUEL CELL BEING COMPENSATED BY LOSSES IN STORAGE AND VICE VERSA. IT HAS BEEN SHOWN THAT ANY FUEL CELL USED IN THIS APPLICATION MUST BE USED AT HIGH POWER DENSITY, AND THE ENSEMBLE MUST BE OPTIMIZED AROUND THE CHARACTERISTICS OF THE FUEL CELL. IN PARTICULAR, THE FUEL CELL MUST BE LIGHT WEIGHT IN kg/m2, BUT MORE PARTICULARLY SHOULD OPERATE AT THE HIGHEST POSSIBLE CURRENT DENSITY TO MAKE 2 kW/kg FOR THE SYSTEM A REALITY. FUEL CELL RUGGEDNESS AND REALIABILITY WILL BE MOST IMPORTANT. FUEL CELL EFFICIENCY IS LESS IMPORTANT. FOR THIS REASON, THE USE OF THE PEM FUEL CELL WITH IMPROVED MEMBRANES (DOW CHEMICAL, POLYIMIDE AND CARBANION ACID POLYMERS) IS PROPOSED. IT HAS THE ADVANTAGE OF OPERATING AT LOW TEMPERATURE WITH RAPID START-UP FROM COLD, IT REQUIRES NO CORROSIVE ELECTROLYTE MANAGEMENT, IT HAS INFINITE LIFE ON STAND, AND IT CAN TOLERATE HIGH PRESSURE DIFFERENTIALS ACROSS ITS ELECTROLYTE MEMBRANE.

TREADWELL CORP
65 OXFORD DR
MOONACHIE, NJ 07074
Program Manager: RICHARD J LAWRENCE
Contract #:
Title: FUELCELL PULSE POWER SOURCE FOR SUBMARINE ELECTROMAGNETIC LAUNCHERS
Topic #: N90-166 Office: NSSC ID #: 41159

ELECTROMAGNETIC LAUNCHERS ARE BEING DEVELOPED FOR SUCH APPLICATIONS AS LAUNCHING TORPEDOES, REMOTELY PILOTED VEHICLES, AND HIGH VELOCITY PROJECTILES. THE MAIN DRIVER IS THE REDUCTION OF THE NOISE GENERATED DURING THE PRESENT TORPEDO LAUNCH EVOLUTION. THE TECHNOLOGY FOR ANY MOBILE APPLICATIONS AND SOME STATIONARY APPLICATIONS WILL REQUIRE A HIGH ENERGY DENSITY POWER SOURCE. THE POWER SOURCE MUST PROVIDE THE ELECTRICAL POWER IN CLOSE PROXIMITY TO THE LAUNCHER TO REDUCE THE LOSSES ASSOCIATED WITH HIGH CURRENTS IN ELECTRICAL CONDUCTORS AND THE EMI. PROTON EXCHANGE MEMBRANES (PEM) FUEL CELLS HAVE DEMONSTRATED ON A SMALL SCALE THE ABILITY TO PROVIDE VERY HIGH PULSED ELECTRICAL ENERGY IN SMALL LIGHT WEIGHT PACKAGES. THE TREADWELL CORPORATION HAS DEMONSTRATED SOME INNOVATIVE CONCEPTS AND THE PULSE CAPABILITY OF THE FUEL CELL POWER SOURCE. TREADWELL HAS DESIGNED AND IS PRESENTLY CONSTRUCTING A CLOSED LOOP 1kW FUEL CELL SYSTEM FOR AN UNMANNED AUTONOMOUS UNDERWATER VEHICLE WHICH PRODUCES DIRECT CURRENT ELECTRICAL POWER FROM THE CONTROLLED REACTION OF REDUCING AND OXIDIZING AGENTS. THIS APPLICATION UTILIZES PRESSURIZED HYDROGEN AND OXYGEN AS THE REACTANTS TO MAXIMIZE ENERGY DENSITY. TREADWELL HAS ALSO TESTED OUR INHOUSE LABORATORY FUEL CELL IN THE PULSED MODE. PRODUCING 200 MICROSCEOND, 450 AMPERE PULSES FOR UP TO 2 HOURS.

WADDAN SYSTEMS
8801 ENCINO AVE
NORTHRIDGE, CA 91325
Program Manager: MAHENDRA SINGH
Contract #:
Title: DOUBLET PIEZOELECTRIC HYDROPHONE
Topic #: N90-167 Office: NSSC ID #: 41160

RESEARCH TO DESIGN AND DEVELOP A DOUBLET PIEZOELECTRIC HYDROPHONE IS PROPOSED HERE. THE

MAIN OBJECTIVE OF THE EFFORT IS TO DEVELOP MICRO-FABRICATION TECHNIQUES TO MAKE MINIATURE HIGH QUALITY HYDROPHONES. A SILICON WAFER IS CHEMICALLY ETCHED, AND A LAYER OF SILICON OXIDE IS GROWN TO FORM A DIAPHRAGM. NEXT, A LAYER OF ZnO IS DEPOSITED TO ACT AS A PIEZOELECTRIC TRANSDUCER TO SENSE THE DEFLECTION OF THE DIAPHRAGM UNDER ACOUSTIC PRESSURE. THE ZnO LAYER HAS ELECTRODES ON EITHER SIDE IN REGIONS WHERE THE HIGH STRESSES DEVELOP IN THE DIAPHRAGM. THESE ELECTRODES ARE USED FOR OUTPUT SIGNALS FROM THE DEVICE. A PAIR OF IDENTICALLY PROCESSED WAFERS IS ALIGNED AND BONDED TOGETHER BACK-TO-BACK TO YIELD A BATCH OF PIEZOELECTRIC HYDROPHONES. WHEN THE HYDROPHONE IS PLACE IN AN ACOUSTIC FIELD, THE SOUND WAVES PRODUCE DIFFERENT DEFORMATIONS IN THE TWO BACK-TO-BACK PLACED DIAPHRAGMS, HENCE, GENERATE A DIFFERENTIAL VOLTAGE ACROSS THE PIEZOELECTRIC. THE OUTPUT SIGNAL IS PROPORTIONAL TO THE PRESSURE GRADIENT ACROSS THE THICKNESS OF THE DIAPHRAGM.

CODAR OCEAN SENSORS LTD
PO BOX 391087
MOUNTAIN VIEW, CA 94039
Program Manager: DR DONALD E BARRICK
Contract #:
Title: SHIPBOARD SEA STATE SENSOR S4 SYSTEM
Topic #: N90-169 Office: NSSC ID #: 41161

A BACKSCATTER MF/HF RADAR SYSTEM IS PROPOSED TO CHARACTERIZE THE WAVEFIELD AROUNS LARGE AMPHIBIOUS NAVAL VESSELS WHILE UNDERWAY. ONLY A FEW MILLIWATTS OF RADIATED POWER YEIDLS SUFFICIENT SIGNAL-TO- NOISE RATIO UNDER EVEN WORST CASE CONDITIONS. A NOVEL 2-3 METER WHIP AT THE TOP OF THE MAST HAS ADEQUATE EFFICIENCY AND BANDWIDTH TO TRANSMIT THIS SIGNAL. MULTIPLE FREQUENCIES ARE EMITTED SIMULTANEOUSLY, EACH RELATED TO AN OCEAN WAVE FREQUENCY OR PERIOD VIA THE PROVEN BRAGG MECHANISM. WAVEHEIGHT ENERGY AT EACH WAVE FREQUENCY IS THUS OBTAINED. THE SHIP'S FORWARD SPEED IMPARTS A DOPPLER SPREADING OF THE ECHO THAT ALLOWS WAVE DIRECTION VS FREQUENCY TO BE DETERMINED; TINY CROSSED-LOOPSTICK RECEIVE ANTENNAS RESOLVE THE PORT-STARBOARD BEARING AMBIGUITY. ALL REAL-TIME PROCESSING IS DONE DIGITALLY, AT DATA RATES THAT DOE NOT EXCEED 128 WORDS PER SECOND. FEASIBILITY/PERFORMANCE STUDIES ARE PLANNED THAT WILL OPTIMIZE THE DESIGN WHILE MINIMIZING COST, SIZE, AND COMPLEXITY.

COMPEER INC
1409 GRAYWOOD DR
SAN JOSE, CA 95129
Program Manager: DAVID M THEOBOLD
Contract #:
Title: REAL-TIME NON-CONTACT WAVE CHARACTERIZATION SYSTEM
Topic #: N90-169 Office: NSSC ID #: 41162

THIS MULTI-PHASE EFFORT IS TO DEVELOP AND TEST A FULL SCALE PROTOTYPE SYSTEM TO RELIABLY CHARACTERIZE THE SEA CONDITIONS EXPERIENCED BY SHIPS CAPABLE OF SUPPORTLING LANDING CRAFT, AIR CUSHION OPERATIONS. THE SYSTEM IS TO MEASURE AND DISPLAY IN REAL-TIME THE SEA STATE CONDITIONS, INCLUDING WAVE HEIGHT, LENGTH, AND PERIOD OF MAXIMUM ENERGY, USING MULTIPLE SHIP-BORNE ULTRASONIC RANGE SENSORS. THE PHASE I EFFORT INCLUDES SYSTEM REQUIREMENTS DEFINITION, COMPARISON OF SENSOR TYPES AND CONFIGURATION, CONCEPT DEFINITION, AND A FEASIBILITY DEMONSTRATION. OPERATIONAL AND TECHNICAL REQUIREMENTS ARE DERIVED AND CANDIDATE CONCEPTS ARE DEFINED TO MEET THE REQUIREMENTS. OPTIMUM SENSOR CONFIGURATION IS BASED UPON REQUIREMENTS SUCH AS RANGE, BEAMWIDTH, COVERTNESS, RELIABILITY, COST, AND LOGISTICS. THE CONCEPT DEFINTION CONSISTS OF THE SYSTEM REQUIREMENTS, OPERATIONAL CONCEPT, INSTALLATION PLAN, SYSTEM BLOCK DIAGRAM, FUNCTIONAL OUTLINE, AND DATA PROCESSING DEFINITION. ESTIMATES OF EXPECTED PERFORMANCE INCLUDE ACCURACY, SEA STATE OPERATIONAL

RANGE, RECORDING CAPACITY FOR DATA TREND ESTIMATION, SIZE, WEIGHT, POWER, COST, AND INTEGRATION COMPLEXITY. A FEASIBILITY DEMONSTRATION ON A MICROCOMPUTER BASED SYSTEM USING A SINGLE SENSOR WILL BE USED TO VERIFY THE CONCEPT.

ENDECO INC
13 ATLANTIS DR
MARION, MA 02738
Program Manager: EDWARD C BRAINARD II
Contract #:
Title: WAVE CHARACTERIZATION SYSTEM
Topic #: N90-169 Office: NSSC ID #: 41163

THE PHASE I STUDY IS TO INVESTIGATE ADAPTING ENDECO, INC. ORBITAL FOLLOWING BUOY TECHNOLOGY TO DEVELOP A RELIABLE AND INEXPENSIVE SELF-ANCHORING BUOY WHICH CAN BE DEPLOYED BY AIRCRAFT, SURFACE SHIPS OR SEAL TEAMS. THE BUOY WILL BE DEPLOYED AT THE OUTER LIMIT OF THE SURF ZONE AND PROVIDE REAL-TIME DIRECTIONAL WAVE SPECTRA BY R.F. TELEMETRY TO A MODIFIER SURFACE FORECASTING MODEL FOR USE IN LCAC LANDING OPERATIONS.

MARITIME DYNAMICS INC
RTE 4 - BOX 424X
LEXINGTON PARK, MD 20653
Program Manager: JOHN D ADAMS
Contract #:
Title: WAVE CHARACTERIZATION SYSTEM
Topic #: N90-169 Office: NSSC ID #: 41164

A PROGRAM IS PROPOSED TO DEFINE REQUIREMENTS FOR AND ESTABLISH THE FEASIBILITY OF A SHIPBORNE SYSTEM TO CHARACTERIZE PREVAILING SEA CONDITIONS. THE SYSTEM IS ULTIMATELY INTENDED FOR INSTALLATION ON AMPHIBIOUS SHIPS TO SUPPORT LCAC MISSION PLANNING AND OPERATIONS.

JOHNSTONE YACHTS INC
11 WILLIAMS ST
STONINGTON, CT 06378
Program Manager: RODNEY JOHNSTONE
Contract #:
Title: AUTORIB-INFLATABLE COMBAT RUBBER RAIDING CRAFT WITH RIGID INFLATABLE BOTTOM
Topic #: N90-170 Office: NSSC ID #: 41165

AN INNOVATIVE CONCEPT IS PROPOSED FOR AN INFLATABLE COMBAT RUBBER RAIDING CRAFT WITH BOTTOM THAT BECOMES A RIGID LOW DRAG HULL UPON INFLATION. THE BENEFITS AND FEATURES WILL INCLUDE HIGH PERFORMANCE AND "PLANNING" CAPABILITY WITH UP TO 3000 LBS PAYLOAD: IMPROVED RIGIDITY AND STRENGTH OF TRANSOM; POSITIVE FLOTATION WITH RESERVE BUOYANCE NOT SOLELY DEPENDENT ON AIR INFLATION; LOW PROFILE AIR- INFLTED TOPSIDES USING ABRASION AND SLASH RESISTANT COATED FABRICS TO MINIMIZE DETECTIBILITY, MAINTENANCE, AND HYDRODYNAMIC DRAG; IMPROVED RIGGING FOR ATTAHCING WEAPONS AND EQUIPMENT SECURELY; AND A PERSONNEL COVER. THE PROPOSED CRAFT WILL OTHERWISE MATCH THE VERSATILITY OF INFLATABLE CRAFT NOW IN USE BY THE SEALS - DEPLOYMENT CAPABILITY.

TRIANGLE RESEARCH & DEVELOPMENT CORP

PO BOX 12696
RSCH TRIANGLE PK, NC 27709
Program Manager: RICHARD A McKINNEY
Contract #:
Title: IMPROVED MATERIALS AND DESIGNS FOR INFLATABLE CRAFT
Topic #: N90-170 Office: NSSC ID #: 41166

THIS PHASE I EFFORT WILL INVESTIGATE THE TECHNICAL FEASIBILITY OF DEVELOPING INNOVATIVE, IMPROVED WAYS TO REDUCE DETECTABILITY, INCREASE SURVIVABILITY, AND INCORPORATE MODERN MATERIALS ADVANCES IN THE MANUFACTURE OF COMBAT RUBBER RAIDING CRAFT (CRRC). COMPONENTS OF INFLATABLE CRAFTS, INCLUDING OVERALL CONSTRUCTION MATERIALS AND TRANSOM CONSTRUCTION, WILL BE REVIEWED FOR REPLACEMENT WITH IMPROVED DESIGNS AND MATERIALS. PRELIMINARY DESIGNS FOR A PROTECTIVE PERSONNEL COVER WILL BE DEVELPED. THE OVERALL DESIGN OF INFLATABLE CRAFTS WILL BE REVIEWED TO IMPROVE RELIABILITY, STABILITY, SAFETY, AND CONSTRUCTION AND PRODUCTION TECHNIQUES. PRELIMINARY SKETCHES AND/OR RECOMMENDATIONS WILL BE PREPARED.

ADVANCED SYSTEM TECHNOLOGIES INC
5113 LEESBURG PIKE - STE 514
FALLS CHURCH, CA 22015
Program Manager: DUANE R BALL
Contract #:
Title: A VLSI NEUROCOMPILER FOR MASSIVELY INTERCONNECTED MODELS
Topic #: N90-171 Office: NSSC ID #: 41167

MASSIVELY INTERCONNECTED COMPUTERS, COMMONLY CALLED NEUROCOMPUTERS, ARE AT THE HEART OF SIXTH-GENERATION COMPUTING. TO DATE, HOWEVER, ONLY NEUROCOMPUTER SIMULATORS AND EMULATORS ARE AVAILABLE. THIS RESEARCH PROJECT WILL DEVELOP TOOLS AND TECHNIQUES TO TRANSLATE NEUROCOMPUTERS INTO COMPUTATIONALLY EQUIVALENT DIGITAL VLSI CIRCUITS. CONCEPTS FROM SWITCHING CIRCUIT THEORY WILL BE USED TO TRANSLATE INDIVIDUAL NODES OR GROUPS OF NEUROCOMPUTER NODES INTO AN EQUIVALENT DIGITAL CIRCUIT. A STOCHASTIC OPTIMIZATION TECHNIQUE, BASED ON THE GENETIC ALGORITHM, WILL BE DEVELOPED TO TRANSFORM THE DIGITAL LOGIC CIRCUIT SO THAT IT MEETS ANALYST SPECIFIED AREA AND RESPONSE-TIME REQUIREMENTS. THE DEGREE OF FAULT-TOLERANCE REQUIRED BY THE ANALYST WILL BE ADDED INTO THE DESIGN USING TECHNIQUES FROM CODING THEORY. THE TOOL DEVELOPED DURING THIS RESEARCH, CALLED A NEUROCOMPILER, WILL GENERATE VHDL DESCRIPTIONS OF THE RESULTING DESIGNS SO THAT SILICON COMPILERS CAN COMPLETE THE TECHNOLOGY DEPENDENT (E.G., CMOS) ELEMENTS OF THE DESIGN. THE NEUROCOMPILER WILL ALSO INTERFACE WITH CHIP PROGRAMMERS AND PRINTED CIRCUIT BOARD DESIGNERS FOR SMALLER SCALE CHIP PRODUCTION.

CIVILIZED SOFTWARE INC
7735 OLD GEORGETOWN RD - #410
BETHESDA, MD 20814
Program Manager: DR GARY KNOTT
Contract #:
Title: STATISTICAL TESTING OF MODEL HYPOTHESIS IN BINOMIAL REGRESSION
Topic #: N90-172 Office: NSSC ID #: 40944

NUMEROUS MILITARILY SIGNIFICANT PROBLEMS, SUCH AS THE EVALUATION OF WEAPONS SYSTEM EFFECTIVENESS, THE SENSITIVITY AND RELIABILITY OF MUNITIONS, AND THE VULNERABILITY OF COMPLEX STRUCTURES TO SEVERE LOADING CONDITIONS, OFTEN INVOLVE THE REGRESSION OF A BINOMIAL PROPORTION (NUMBER OF SUCCESSES/NUMBER OF TRIALS) ON SOME LOADING FUNCTIONS OR QUANTITY THAT IS ASSUMED TO CHARACTERISE THE SEVERITY OF THE TRAIL ENVIRONMENT. THE

PROBABILITY OF SUCCESS ESTIMATED IN THIS MANNER (AS THE MEAN OF THE BINOMIAL PROPORTION) AS WELL AS FURTHER INFERENCE, IS DEPENDENT UPON THE ASSUMED MODEL HYPOTHESIS, I.E., THE LOADING FUNCTION (OR CLASS OF FUNCTIONS) EMPLOYED AND THE CLASS OF DISTRIBUTIONS USED TO RELATE PROBABILITY OF SUCCESS TO LOADING LEVEL. THE CREDIBILITY OF ANY PREDICTION MODEL DEVELOPED IN THIS MANNER DEPENDS ON A STATISTICAL TEST OF THE MODEL HYPOTHESIS AND THE POWER OF THE TEST AGAINST ALTERNATIVE MODEL HYPOTHESES. IN PHASE I, A CHI-SQUARED-BASED GOODNESS-OF-FIT TEST FOR MODELS OF BINOMIAL FAILURE DATA WILL BE STUDIED BY SIMULATION, AND CORRESPONDING POWER AND SAMPLE-SIZE RESULTS WILL BE TABULATED AND MODELED. A NOVEL GOODNESS-OF-FIT TEST BASED ON BINARY STORAGE TREE STRUCTURES WILL BE EXPLORED. THIS TEST HAS PROMISE TO SUPERCEDE THE KOLMOGOROV-SMIRNOV TEST IN SOME CIRCUMSTANCES. IN PHASE II, THIS AND OTHER GOODNESS-OF-FIT TESTS WILL BE FURTHER DEVELOPED.

EXFLUOR RESEARCH CORP
PO BOX 7807
AUSTIN, TX 78713
Program Manager: DR TIMOTHY J JUHLKE
Contract #:
Title: A NEW METHOD FOR PRODUCING PENTAFLUOROTHIO (SF{5}) SUBSTITUTED FUNCTIONAL FLUOROCARBONS
Topic #: N90-173 Office: MSWC ID #: 40947

THE GOAL OF THIS RESEARCH PROGRAM IS TO DEVELOP A NEW AND CHEAPER METHOD FOR PRODUCING PENTAFLUOROTHIO (SF5) SUBSTITUTED FUNCTIONAL FLUOROCARBONS. THESE MATERIALS HAVE POTENTIAL AS BUILDING BLOCKS FOR ENERGETIC MATERIALS. THEY WILL BE PRODUCED BY THE CONTROLLED REACTION OF SULFUR SUBSTITUTED HYDROCARBONS WITH ELEMENTAL FLUORINE.

SPARTA INC
4520 EXECUTIVE DR - STE 210
SAN DIEGO, CA 92121
Program Manager: R DANIEL STEVENSON
Contract #:
Title: DISCONTINUOUSLY REINFORCED MAGNESIUM FOR MISSILE COMPONENTS
Topic #: N90-174 Office: NSWC ID #: 39802

PRESENT AND FUTURE GENERATION NAVY MISSILES REQUIRE METAL MATRIX COMPOSITE MATERIALS WITH PROPERTIES TAILORED FOR USE AS HEAT SINKS, MIRRORS, OR STABLE PLATFORMS. A NEW PARTICULATE REINFORCED MAGNESIUM ALLOY MATERIAL OFFERING AN OUTSTANDING COMBINATION OF LOW DENSITY, LOW COEFFICIENT OF THERMAL EXPANSION (CTE), HIGH THERMAL CONDUCTIVITY WITH ISOTROPIC PROPERTIES IS PROPOSED. THE MATERIAL CAN BE PROCESSED IN MUCH THE SAME MANNER AS EXISTING PARTICULATE REINFORCED MAGNESIUM COMPOSITE MATERIALS. AT A NOMINAL REINFORCEMENT LOADING OF 20% BY VOLUME, A THERMAL CONDUCTIVITY OF 190 W/m-K IS PREDICTED, FAR SUPERIOR TO THE 110 W/m-K MEASURED FOR 20% VOLUME LOADED SiC WHISKER REINFORCED MAGNESIUM ALLOY. AT THE SAME LOADING A CTE OF 5.8 X 10(-6) m/m/K IS PREDICTED FOR THE PROPOSED MATERIAL, COMPARED WITH 12.2 X 10(-6) FOR THE EXISTING SiC REINFORCED MAGNESIUM ALLOY. THE EQUIAXED NATURE OF THE REINFORCEMENT LEADS TO THESE PROPERTIES BEING ISOTROPIC. THE PROPOSED PROGRAM IS CENTERED ON THE FABRICATION OF THIS NEW MATERIAL AND SUBSEQUENT TEST OF IT'S PROPERTIES TO DEMONSTRATE THAT THEY ARE AS PREDICTED, AND ISOTROPIC IN NATURE. TESTS WILL INCLUDE METALLOGRAPHY, SCANNING ELECTRON MICROSCOPY (SEM). DENSITY, COEFFICIENT OF THERMAL EXPANSION, AND THERMAL CONDUCTIVITY.

SENSIS CORP

5793 WIDEWATERS PKWY
DeWITT, NY 13214
Program Manager: RICHARD R KINSEY
Contract #:
Title: PHASED ARRAY ANTENNA
Topic #: N90-175 Office: NSWC ID #: 40948

THE WEIGHT AND COST OF FIXED PHASED ARRAYS PRECLUDES THEIR DEPLOYMENT ON MANY SHIPS THAT CURRENTLY HAVE INADEQUATE RADAR CAPABILITY. AN ALTERNATIVE APPROACH THAT COULD SATISFY THIS NEED WOULD BE A BACK-TO-BACK, ROTATING PHASED ARRAY RADAR. WITH DUAL-PLANE MONOPULSE AND ELECTRONIC SCAN IN ELEVATION, SUCH A RADAR COULD PROVIDE THE DATA RATE REQUIRED FOR WEAPON SUPPORT, SURFACE SEARCH, AND SHORT RANGE SURVEILLANCE. THE OBJECTIVE OF THIS PROJECT IS TO DESIGN AN ANTENNA WITH THIS CAPABILITY THAT IS ALSO LIGHTWEIGHT AND LOW COST. WITH ROW PHASE SHIFTERS, SLOTTED- WAVEGUIDE ARRAYS CAN ELECTRONICALLY SCAN IN ELEVATION AND PROVIDE MONOPULSE IN THAT PLANE. THEY ARE ALSO ATTRACTIVE BECAUSE OF THEIR LIGHTWEIGHT AND LOW COST COMPARED TO A FULLY PHASED ARRAY. HOWEVER, NO GOOD MEANS FOR OBTAINING AZIMUTH MONOPULSE PRESENTLY EXISTS. THE USUAL TECHNIQUE OF AZIMUTH BEAM SPLITTING ON MULTIPLE HITS IS NOT AN ACCEPTABLE ALTERNATIVE FOR THE PRESENT APPLICATION BECAUSE OF THE HIGH DATA RATE REQUIREMENTS. THE ANTENNA WE ARE PROPOSING PROVIDES THE NECESSARY DUAL-PLANE MONOPULSE CAPABILITY WHILE RETAINING THE BASIC SIMPLICITY OF A CONVENTIONAL WAVEGUIDE ARRAY. THE OBJECTIVE OF THIS PROJECT IS TO COMPLETE AN ANTENNA DESIGN WITH PREDICTIONS OF PERFORMANCE OVER THE OPERATING FREQUENCY BAND AND OVER ALL SCAN ANGLES.

PHYSICAL RESEARCH INC
25500 HAWTHORNE BLVD - STE 2300
TORRANCE, CA 90505
Program Manager: GERALD L FITZPATRICK
Contract #:
Title: ADVANCED MAGNETO-OPTIC/EDDY CURRENT TECHNIQUES FOR DETECTION OF HIDDEN CORROSION UNDER AIRCRAFT SKIN
Topic #: N90-176 Office: NSWC ID #: 40951

RECENTLY, NEW MAGNETO-OPTIC/EDDY CURRENT TECHNOLOGY HAS BEEN DEVELOPED FOR RAPID INSPECTION OF CRACKS INITIATING NEAR RIVETS IN ALUMINUM AIRCRAFT ALLOYS. THERE IS EVIDENCE THIS TECHNOLOGY CAN BE DEVELOPED FOR RAPID DETECTION AND IMAGING OF SUBSURFACE CRACKS AND CORROSION. UNCONVENTIONAL EDDY CURRENT INDUCTION METHODS EXCITE ELECTROMAGNETIC FIELDS IN THE PARTS, AND DETECTION IS ACCOMPLISHED WITH A MAGNETO-OPTIC SENSOR, PRODUCING DIRECT, REAL-TIME IMAGING OF DEFECTS. THE MAGNETO-OPTIC SENSOR RESPONS TO SMALL STATIC OR TIME VARYING MAGNETIC FIELDS NORMAL TO THE INSPECTION SURFACE. THESE FIELDS ARE PRODUCED WHEN CRACKS OR OTHER DEFECTS, INCLUDING CORRODED AREAS, INTERACT WITH THE INDUCED ELECTRIC CURRENTS. THEMAGNETO- OPTIC SENSOR RESPONDS TO FREQUENCIES FROM 0 (DC) TO OVER 250 KHz. THE LOWER FREQUENCIES (0 TO ABOUT 10 KHz) SHOULD BE USEFUL FOR IMAGING AND DETECTION OF SUBSURFACE CRACKS AND CORROSION, AND THE HIGHER FREQUENCIES (10 KHz TO OVER 200 KHz) FOR DETECTION AND CHARACTERIZATION OF SURFACE CRACKS. DIRECT OBSERVATION OF THE MAGNETO-OPTIC SENSOR, USING POLARIZED LIGHT AND AN ANALYZER, REVEALS REAL-TIME IMAGES OF DEFECTS. THIS NEW TECHNOLOGY OFFERS THE ADVANTAGES OF VERY RAPID COVERAGE OF LARGE AREAS, HIGHER SENSITIVITY TO SMALL CRACKS, MORE DIRECT DETECTION AND CLASSIFICATION OF DEFECTS, AND SIMPLE, INEXPENSIVE RECORDING OF THE ENTIRE INSPECTION.

DISPLAYTECH INC
2200 CENTRAL AVE
BOULDER, CO 80301

Program Manager: MARK A HANDSCHY
Contract #:
Title: INTEGRATED CIRCUIT PLANARIZATION FOR FERROELECTRIC LIQUID CRYSTAL HYBRID OPTO-ELECTRONIC DEVICES
Topic #: N90-177 Office: NSWC ID #: 40953

FERROELECTRIC LIQUID CRYSTALS (FLCs) ARE FAST (10 MICROSECONDS), LOW-VOLTAGE, LOW-POWER ELECTRO-OPTIC MATERIALS THAT ARE VERY SUITABLE FOR HYDRIBIZATION WITH VLSI CIRCUITS TO MAKE A VARIETY OF NOVEL OPTO-ELECTRONIC DEVICES, E.G. 265 X 256 SPATIAL LIGHT MODULATORS WITH 10 KHz FRAME RATES. SINCE THE INTEGRATED CIRCUIT (IC) MUST SERVE IN THESE DEVICES ALSO AS AN OPTCAL SUBSTRATE, SMOOTHING OF CIRCUIT TOPOGRAPHY IS NECESSARY TO ACHIEVE ACCEPTABLE DEVICE OPTICAL UNIFORMITY. WE PROPOSE HERE TO ADAPT IC WAFER-SCALE PLANARIZATION PROCESSES FOR VLSI/FLC HYBRID DEVICES. WE ALSO PROPOSE TO DEVELOP NOVEL DIE-SCALE PLANARIZATION PROCESSES TO ENABLE FABRICATION OF SMALL QUANTITIES OF "APPLICATION-SPECIFIC" OPTO-ELECTRONIC DEVICES.

PHYSICAL OPTICS CORP
1545 W 237TH ST - STE B
TORRANCE, CA 90505
Program Manager: DR RAY T CHEN
Contract #:
Title: NONLINEAR TRANSFORMATION USING HALFTONES
Topic #: N90-177 Office: NSWC ID #: 40952

POC IS PROPOSING TO DEVELOP AND DEMONSTRATE A COMPLETELY OPTICAL SYSTEM FOR REAL-TIME NONLINEAR TRANSFORMATION. THE MAIN FEATURE OF THE SYSTEM IS THAT IT EMPLOYS HALFTONED IMAGES. THIS ALLOWS THE PROCESSOR TO BE TUNABLE FOR DIFFERENT NONLINEAR TRANSFORMS. A PRECOMPENSATION ALGORITHM PROVIDES THE UTILIZATION OF A REAL-TIME RECORDING DEVICE WITH AN ARBITRARY TRANSFER FUNCTION, AND A VARIABLE DIAPHRAGM ALLOWS A SIMPLE RECTANGULAR GRATING TO BE USED INSTEAD OF A SPECIALLY PREPARED HALFTONE SCREEN. THESE CHARACTERISTICS MAKE THE DEVICE USEFUL IN VERY HIGH SPEED INFORMATION SYSTEMS.

ELECTRONIC WARFARE ASSOCS INC
2071 CHAIN BRIDGE RD
VIENNA, VA 22182
Program Manager: ROBERT BASSETT
Contract #:
Title: EMBEDDED TRAINING CAPABILITY FOR AFLOAT CRYPTOLOGIC SYSTEMS
Topic #: N90-178 Office: NSWC ID #: 40954

THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP A LOW RISK DESIGN APPROACH TO EMBEDDED TRAINING FOR AFLOAT CRYPTOLOGIC SYSTEMS. DESIGN RATIONAL WILL BE BASED ON INVESTIGATIONS INTO DESIGN OBJECTIVES, BASED UPON STATED FLEET OPERATIONAL REQUIREMENTS; TRAINING METHODOLOGIES, INSTRUCTIONAL TECHNOLOGY, SCENARIO GENERATION CAPABILITIES, OPERATOR PERFORMANCE MEASUREMENT CRITERIA AND STATE OF THE ART HARDWARE AND SOFTWARE TECHNOLOGY. DESIGN CONSIDERATIONS MUST ALSO SUPPORT NON-INTERUPTIVE INTERFACE TO TACTICAL EQUIPMENT AND APPLICABLE MIL-STANDARDS. ULTIMATELY, THE PROJECT WILL DEFINE A DESIGN APPROACH THAT WILL PROVIDE EFFECTIVE DYNAMIC TRAINING SCENARIOS TO CRYPTOLOGIC OPERATORS IN COORDINATION WITH COMBAT INFORMATION CENTER (CIC) TRAINING.

DELFIN SYSTEMS
1349 MOFFETT PARK DR

SUNNYVALE, CA 94089
Program Manager: KENNETH W CUMINGS
Contract #:
Title: CRYPTOLOGIC ESM EXPERT SYSTEM MAN-MACHINE INTERFACE DESIGN
Topic #: N90-179 Office: NSWC ID #: 40955

CRYPTOLOGIC OPERATIONS TODAY ARE MUCH MORE COMPLEX THAN THOSE OF JUST A FEW SHORT YEARS AGO. THE RF ENVIRONMENT COMPLEXITY HAS INCREASED. TO MEET THIS INCREASED COMPLEXITY, AN ARRAY OF FIELDED CRYPTOLOGIC ESM EQUIPMENTS, SUBSYSTEMS, AND AUTOMATED ANALYTICAL TOOLS HAVE BEEN, OR ARE BEING, DEVELOPED. SOME IMPROVEMENT HAS BEEN ACHIEVED, ESPECIALLY WITH THE INTRODUCTION AND PIONEERING USE OF EXPERT SYSTEMS; HOWEVER, USING CO-LOCATED SUBSYSTEMS IN A COORDINATED MANNER ONBOARD A PLATFORM IS DIFFICULT DUE TO DISPARITIES IN PROGRAMMING ENVIRONMENTS, SUBSYSTEM SPECIALIZATION, THE EXTENSIVE AND DIFFERENT MAN-MACHINE-INTERFACES (MMI). IMPLEMENTED MMI DESIGN SHOULD REFLECT HOW THE OPERATOR ACTUALLY USES AND INTERACTS WITH THE MACHINE. DELFIN WILL ANALYZE AND DESIGN A GENERIC EXPERT SYSTEM MMI USEFUL IN ANY DEPLOYED ESM SYSTEM. DELFIN WILL GENERICALLY DEFINE CRYPTOLOGIC SYSTEMM USE AND TECHNICAL OPERATORPROCEDURES, IDENTIFY AND ORGANIZE THE UNIVERSAL FUNCTIONALITIES OF DEPLOYED CRYPTOLOGIC SYSTEMS, DEVELOP AN MMI INTERFACE REQUIREMENTS MATRIX, INVESTIGATE POTENTIALLY USEFUL AI MMI DESIGN TECHNOLOGIES, AND THEN DESIGN THE EXPERT SYSTEM MMI. DELFIN WILL DEVELOP AN APPROACH FOR IMPLEMENTING THE MMI DESIGN FOR CURRENTLY DEPLOYED SYSTEMS AND FOR SYSTEMS UNDER PROCUREMENT.

ADVANCED SYSTEM TECHNOLOGIES INC
12200 E BRIARWOOD AVE - STE 260
ENGLEWOOD, CO 80112
Program Manager: DR ROBERT T GOETTGE
Contract #:
Title: KNOWLEDGE-BASED DISTRIBUTED OPERATING SYSTEM ASSISTANT
Topic #: N90-180 Office: NSSC ID #: 41168

USE OF DISTRIBUTED COMPUTING IN NAVY SYSTEMS IS INCREASING. DISTRIBUTED OPERATING SYSTEMS (DOS) PROVIDE THE ADVANTAGES OF DISTRIBUTED COMPUTING TO USER APPLICATIONS. REQUIREMENTS FOR REAL- TIME PERFORMANCE, RELIABILITY/FAULT TOLERANCE, AND SECURITY MUST BE ADDRESSED BY A DOS. APPLICATION OF DOS TECHNOLOGY IS A COMPLICATED TASK. A KNOWLEDGE-BASED ASSIST WILL FACILITATE THE USE OF DISTRIBUTED OPERATING SYSTEMS IN NAVY APPLICATIONS. THREE TECHNICAL OBJECTIVES WILL DEMONSTRATE THE FEASIBILITY OF A KNOWLEDGE-BASED DOS ASSISTANT: (1) DEVELOP A REFERENCE MODEL FOR DOS USAGE; (2) SHOW THAT DOS USAGE KNOWLEDGE IS AMENABLE TO KNOWLEDGE-BASED TECHNIQUES; AND (3) SHOW THAT GENERIC AND SPECIFIC DOS KNOWLEDGE CAN BE INTEGRATED. IN PHASE I THREE OBJECTIVES WILL BE ADDRESSED BY: DEVELOPING A DOS REFERENCE MODEL; DEFINING THE SCOPE AND STRUCTURE OF THE DOS USAGE KNOWLEDGE-BASE; DEVELOPING RULES FOR SELECTION OF REAL-TIME SCHEDULING ALGORITHMS; AND DEVELOPING RULE REFINEMENT TECHNIQUES TO ENSURE CONSISTENCY AND INHERITANCE AMONG DIFFERENT LEVELS OF KNOWLEDGE. PHASE I RESEARCH WILL TAKE ADVANTAGE OF EXISTING RESULTS IN KNOWLEDGE-BASED DESIGN ASSISTANTS FROM PREVIOUS SBIR PROJECTS PERFORMED FOR THE NAVY AND NASA.

PHYSICAL OPTICS CORP
2545 W 237TH ST - STE B
TORRANCE, CA 90505
Program Manager: DR GAJENDRA SAVANT
Contract #:
Title: ADAPTIVE LEARNING OPTICAL MULTILAYER NEURAL NETWORKS BASED ON ERASABLE DYE-POLYMER

Topic #: N90-182 Office: NSWC ID #: 40956

THE GOAL OF THIS PROGRAM IS TO FILL THE NEED FOR A REAL-TIME ADAPTIVE OPTICAL NEURAL NETWORK SYSTEM TO SUPPORT A WIDE RANGE OF MILITARY REAL-TIME PATTERN RECOGNITION APPLICATIONS. THE MOTIVATION FOR THIS PROPOSED WORK IS TO OPTICALLY IMPLEMENT AN ADAPTIVE LEARNING ALGORITHM, BACKWARD ERROR PROPAGATION RULE, IN A MULTILAYER NEURAL NETWORK. THE PROPOSED OPTICAL NEURAL NETWORK IS BASED ON POLARIZATION BIREFRINGENT HOLOGRAPHY IN PHYSICAL OPTICS CORPORATION (POC)'S NEWLY DEVELOPED EDP MATERIAL. REAL-TIME SELECTIVE EHANCEMENT/ERASURE OF HOLOGRAMS IS A UNIQUE FEATURE OF THIS TYPE OF HOLOGRAPHY, WHICH FORMS THE BASIS FOR IMPLEMENTING ADAPTIVE LEARNING WITH MICROSECOND RESPONSE TIME. WITH THIS NOVEL APPROACH, POC WILL DEMONSTRATE A REAL TIME ADAPTIVE OPTICAL MULTILAYER NEURAL NETWORK THAT IS ABLE TO SOLVE COMPLICATED COGNITIVE PROBLEMS THROUGH LEARNING.

ODETICS INC
1515 S MANCHESTER AVE
ANAHEIM, CA 92802
Program Manager: RICHARD HOLBEN
Contract #:
Title: AN ADAPTIVE NEURAL NETWORK ARCHITECTURE FOR TARGET TRACKING AND RECOGNITION
Topic #: N90-183 Office: NSWC ID #: 40957

THIS PHASE I RESEARCH WILL PRODUCE A DESIGN FOR AN ADAPTIVE NEURAL NETWORK ARCHITECTURE THAT WILL PERFORM TARGET RECOGNITION AND TRACKING OF IR DATA. THIS WORK WILL DESCRIBE TWO NEURAL NETWORK MODELS THAT WILL IMPLEMENT A MOTION-BASED TRACKING PARADIGM WHICH WILL LOCATE, EXTRACT, IDENTIFY AND TRACK TARGETS FROM IR DATA. THE PARADIGM PERFORMS THESE FUNCTIONS FOR TARGETS WHICH ARE MOVING RELATIVE TO THE BACKGROUND. THE MODELS DESIGNED FOR PHASE I CONSIST OF A MOTION SEGMENTATION NETWORK FOR EXTRACTING SPATIAL PATTERNS AND A SEQUENCE RECOGNITION NETWORK FOR DETERMINING TARGET IDENTIFY BASED ON MULTIPLE SAMPLES. IN PHASE II OTHER NETWORKS WILL BE ADDED, INCLUDING A DUAL-SAMPLING METHOD FOR PROCESSING MOTION DATA AND A CONTROL NETWORK FOR COMBINING INFORMATION FROM THE DUAL SAMPLES TO PRODUCE ROBUST MOTION-BASED RECOGNITION AND TRACKING.

TECHNICAL RESEARCH ASSOCS INC
410 CHIPETA WY - STE 222
SALT LAKE CITY, UT 84108
Program Manager: DR M TAYLOR ABEGG
Contract #:
Title: EUTECTIC COMBINATIONS OF HYDROXYLAMMONIUM PERCHLORATE (HAP) AND OXIDIZERS
Topic #: N90-184 Office: NSWC ID #: 40958

THE OBJECTIVES OF THIS PHASE I EFFORT ARE: I. STUDY EUTECTIC COMBINATIONS OF HYDROXYLAMMONIUM PERCHLORATE AND OTHER OXIDIZERS. a. DEVELOP THE PHASE DIAGRAM OF HAP AND AMMONIUM PERCHLORATE. b. DEVELOP THE PHASE DIAGRAM OF HAP AND POTASSIUM PERCHLORATE. II. STUDY THE EFFECTS OF MONOETHANOLAMINE PERCHLORATE AS A MELTING POINT DEPRESSANT WITH THE ABOVE TWO COMBINATIONS.

BRIMROSE CORP OF AMERICA
5020 CAMPBELL BLVD
BALTIMORE, MD 21236
Program Manager: JOLANTA I SOOS

Contract #:
Title: HIGH RESOLUTION ACOUSTO-OPTIC DEVICES FOR OPTICAL SIGNAL PROCESSING
Topic #: N90-185 Office: NSWC ID #: 40959

ACOUSTO-OPTIC (A-O) BRAGG CELLS PLAY AN IMPORTANT ROLE IN SIGNAL PROCESSING SYSTEMS DUE TO THEIR REAL TIME PROCESSING CAPABILITIES, AS WELL AS THEIR CONVERSION CAPABILITIES OF A FUNCTION OF TIME TO A FUNCTION OF SPACE AND TIME. IN THIS PROGRAM, BRIMROSE WILL INVESTIGATE, DESIGN AND FABRICATE STATE-OF-THE-ART ACOUSTO-OPTIC DEVICES MADE OUT OF TeO2 MATERIAL AND DESIGN TO INCREASE THEIR BANDWIDTH (UP TO 80 MHz) TO INCREASE THE OPTICAL APERTURE (UP TO 50 us) AND INCREASE THEIR DIFFRACTION EFFICIENCY, THROUGH THE USE OF ACOUSTO-OPTIC DESIGN TECHNIQUES SUCH AS ACOUSTIC BEAM STEERING (PHASED ARRAY TECHNOLOGY) AND TANGENTIAL PHASE MATCHING OF ANISOTROPING BRAGG DIFFRACTION. THE SIGNIFICANT REDUCTION IN ACOUSTIC POWER ACCOMPANYING THESE TECHNIQUES ALSO LEADS TO THE REDUCTION OF THE INTERMODULATION PRODUCTS, INCREASING THE DEVICE DYNAMIC RANGE, HENCE INCREASING THE OVERALL PERFORMANCE OF THE SIGNAL PROCESSING SYSTEM. TWO TYPES OF SHEAR MODE TeO2 DEVICES WILL BE INVESTIGATED USING [110] AND [001] AS ACOUSTIC WAVE PROPAGATION DIRECTIONS. EACH DEVICE WILL HAVE APODIZED PHASED ARRAY TYPE TRANSDUCER FOR MAXIMUM PERFORMANCE IMPROVEMENT. SHOULD THIS WORK BECOME CLASSIFIED, BRIMROSE HAS A SECRET FACILITY CLEARANCE. ALSO, UNDER THE SBA FROM THE OFFICE OF INNOVATION RESEARCH AND TECHNOLOGY'S SIXTH YEAR RESULTS TO CONGRESS, JUNE 1989, BRIMROSE WAS SELECTED FROM 9,000 COMPANIES FOR OUTSTANDING SBIR COMMERCIALIZATION PROGRESS AND SUCCESS.

NKF ENGINEERING INC
4200 WILSON BLVD - STE 1000
ARLINGTON, VA 22203
Program Manager: DR DANIEL CURTIS
Contract #:
Title: ADVANCED DAMAGE MODEL DEVELOPMENT
Topic #: N90-186 Office: NSWC ID #: 40960

THE OBJECTIVE OF THE PROPOSED EFFORT IS TO DEVELOP ADVANCED CAPABILITIES FOR COMPUTER CODES IN PREDICTING THE DAMAGE INFLICTED ON NAVAL TARGETS BY UNDERWATER WARHEADS. THE PROPOSED RESEARCH EFFORT WILL TAKE SOME HIGHLY REGARDED, WELL DOCUMENTED, AND VALIDATED GENERAL PURPOSE CODES AND ADD CAPABILITIES TAILORED TO THE UNDERWATER WARHEAD DYNAMICS PROBLEM AND COMBINE ALL REQUIRED CAPABILITIES INTO ONE SOFTWARE FRAMEWORK. IT IS ANTICIPATED THAT THE FRAMEWORK WILL BE BASED ON THE DYNA, PISCES, AND XL CODES AND WILL INVOLVE THE ADDITION OF THE DAA AND AN INTERFACE BETWEEN THE 3-D FINITE ELEMENT DYNA AND THE 2-D FINITE DIFFERENCE CODE PISCES TO PROVIDE SOLUTIONS IN BOTH THE EXTREME AND MODERATE DAMAGE REGIONS. THE NEW CAPABILITIES WILL BE DOCUMENTED AND VALIDATED WITH TEST DATA. BY INCREASING THE NUMBER OF DIFFERENT PHYSICAL EFFECTS (LARGE DYNAMIC PLASTIC DEFORMATION, FLUID-STRUCTURE INTERACTION, SPALLING, ETC.) THAT CAN BE HANDLED BY THE PROPOSED SOFTWARE FRAMEWORK BY INCREASING ITS EFFICIENCY FOR RUNNING LARGER PROBLEMS, AND BY EASING THE BURDEN ON THE ANALYST WITH SOPHISTICATED MODEL GENERATORS AND OUTPUT PROCESSORS AND DISPLAY, MORE REALISTIC MODELS CAN BE ANALYZED. SEMI-AUTOMATED MODEL GENERATION, ADVANCED DATA PRE- AND POST-PROCESSING, AND EXPERT SYSTEM CAPABILITY WILL ALSO BE ADDED TO ASSIST IN THE MODELLING EFFORTS.

TRIDENT SYSTEMS INC
3554 CHAIN BRIDGE RD - STE 200
FAIRFAX, VA 22030
Program Manager: NICHOLAS E KARANGELEN
Contract #:
Title: PRELIMINARY TOUCHSCREEN DISPLAY PROTOTYPING TOOL AND TOUCHSCREEN DESIGN STUDY

Topic #: N90-187 Office: NSWC ID #: 40961

TOUCHSCREEN REPRESENT A SIGNIFICANT OPPORTUNITY TO ENHANCE THE OPERABILITY OF COMPLEX SYSTEMS MAN-MACHINE INTERFACES IN BOTH MILITARY AND INDUSTRY. THE ADVANTAGES OF A TOUCHSCREEN INTERFACE CAN BE SIGNIFICANTLY DIMINISHED (AND EVEN REVERSED IN EXTREME CASES) IF THE IMPLEMENTATION OF THE TOUCHSCREEN INTERFACE IS CARELESSLY DESIGNED. THE SIZE, SPACING, RESPONSE TIME, AND USE OF FEEDBACK MUST ACCOMMODATE THE USER'S ABILITY TO ACCURATELY AND QUICKLY SELECT TOUCH-SENSITIVE REGIONS ON THE SCREEN. A PRELIMINARY TOUCHSCREEN DISPLAY PROTOTYPING TOOLD WILL BE DEVELOPED UNDER THIS PROJECT, PROVIDING AN INTERACTIVE, GRAPHICAL, OBJECT-ORIENTED ENVIRONMENT FOR PROTOTYPING GRAPHIC DISPLAYS WITH TOUCHSCREEN INTERFACES. THE PRELIMINARY TOOL WILL BE USED TO SUPPORT A TOUCHSCREEN DISPLAY DESIGN STUDY. THE STUDY WILL BE PLANNED, EXECUTED, AND DOCUMENTED UNDER PHASE I OF THIS PROJECT, WILL EXAMINE HUMAN ENGINEERING ISSUES CONCERNING TOUCHSCREEN EMPLOYMENT, AND WILL INVESTIGATE KEY FACTORS IN THE DESIGN AND USE OF TOUCHSCREEN INTERFACES. BASED ON THE EXPERIENCE GAINED IN BUILDING THE PRELIMINARY TOOL AND IN CONDUCTING THE HUMAN FACTORS STUDY, A CONCEPTUAL DESIGN FOR A FULL-SCALE ADVANCED TOUCHSCREEN DISPLAY DEVELOPMENT TOOL WILL BE DEVELOPED.

Q-DOT INC
1069 ELKTON DR
COLORADO SPRINGS, CO 80907
Program Manager: DR STEPHEN D GAALEMA
Contract #:
Title: HIGH-SPEED GATED DETECTOR
Topic #: N90-188 Office: NSWC ID #: 40962

Q-DOT PROPOSES A NOVEL, HIGH-SPEED LASER RANGING DETECTOR FOR USE UNDERWATER. A SOLID-STATE, SEGMENTED DETECTOR IS USED IN PLACE OF A PMT. SINCE THE DETECTOR CAN HANDLE HUGE (E.G., 1,000 TO 1,000,000 TIMES FULL SCALE) OVERLOADS AND RECOVER TO FULL SENSITIVITY AS QUICKLY AS A FEW NANOSECONDS, IT WILL HANDLE BACKSCATTER VERY WELL. SHARP RANGE-GATE RESOLUTION IS AFFORDED BY RANGE GATES AS NARROW AS 2 ns (0.75'). RANGE RESOLUTION AS FINE AS 0.1 ns (P.O4') APPEARS TO BE FEASIBLE, PROVIDED THAT ADEQUATE PULSE SYNCHRONIZATION IS POSSIBLE. FINALLY, THIS SAME DETECTOR CAN BE OPERATED IN AN IMAGING MODE WITH PROGRAMMABLE SUBARRAY SIZING. THUS, A SINGLE DETECTOR IS OPERABLE IN SEVERAL MODES TO TRACK MISSION REQUIREMENTS AS THEY DEVELOP.

OMEGA INTERNATIONAL TECHNOLOGY INC
1360 BUSCH PKWY
BUFFALO GROVE, IL 60089
Program Manager: DR NAND K GUPTA
Contract #:
Title: DIGITAL TANGENTIAL X-RAY SCANNER FOR LOADED ROCKET MOTORS
Topic #: N90-189 Office: NSWC ID #: 40963

FOR THE LARGE LOADED ROCKET MOTORS, THE ROCKET FUEL IS MOSTLY EXAMINE AT PRESENT BY TAKING MANY SELECTED TANGENTIAL X-RAY FILM EXPOSURES WITH HIGH ENERGY (ACCELERATOR TYPE) X-RAY SOURCE. THESE TANGENTIAL X-RAY EXPOSURE FILMS ARE INTERPRETED BY AN EXPERT RADIOGRAPHER FOR ANY ANOMALY OR PROBLEMS. THIS PROCEDURE HAS POOR VOID AND CRACK DETECTABILITY, IS SLOW AND CUMBERSOME AND REQUIRES MANUAL INTERPRETATION OF THE FILM. OFTEN ONLY A LIMITED X-RAY EXPOSURES ARE TAKEN AND MOST OF THE FUEL IS NOT EVEN FILMED AND PROBLEMS ARE OFTEN MISSED. WE PROPOSE TO INVESTIGATE THE CONTIGUOUS LINEAR SOLID STATE X-RAY DETECTOR ARRAYS INSTEAD OF FILM TO COLLECT AND INTERPRET THE TANGENTIAL X-RAY EXPOSURE DATA. THIS WOULD LEAD TO A TOTALLY AUTOMATIC SCANNING SYSTEM. THE SOLID STATE

DETECTORS HAVE SUPERIOR CONTRAST RESOLUTION AND WIDE DYNAMIC RANGE AND WOULD BE ABLE TO DETECT SMALLER CRACKS AND VOIDS. THE SCANNING METHOD AND INTERPRETATION WOULD BE FAST AND AUTOMATIC. ENTIRE ROCKET MOTOR CAN BE INVESTIGATED IN REASONABLE TIME.

BERKELEY RESEARCH ASSOCS
PO BOX 241
BERKELEY, CA 94701
Program Manager: NINO R PEREIRA
Contract #:
Title: TIME-RESOLVED X-RAY SPECTRUM DIAGNOSTIC FOR FLASH BREMSSTRAHLUNG GENERATORS
Topic #: N90-190 Office: NSWC ID #: 40964

THE GOAL OF THE PROPOSED RESEARCH IS TO INVESTIGATE TWO PROMISING APPROACHES FOR THE TIME-RESOLVED MEASUREMENT OF BREMSSTRAHLUNG IN THE RANGE OF ~ 1 MeV ENERGY. ONE IS A MAGNETIC X-RAY DIODE (MAGNETIC XRD) WHICH EMPLOYS A MAGNETIC FIELD TO PROVIDE ENERGY DISCRIMINATION OF COMPTON ELECTRONS PRODUCED IN THE DETECTOR BY THE X-RAYS. THE OTHER APPROACH USES CHERENKOV EMISSION IN MATERIALS WITH DIFFERENT INDEX OF REFRACTION TO DETERMINE THE ENERGY DISTRIBUTION OF COMPTON ELECTRONS. THE RESEARCH OBJECTIVE IS TO DETERMINE THE SENSITIVITY OF THESE APPROACHES TO THE BREMSSTRAHLUNG SPECTRUM. PREDICTION OF THHE RESPONSE OF PROTOTYPE DEVICES WILL BE CALCULATED WITH COMPUTER CODES SUCH AS ITS. A PROOF-OF-PRINCIPLE TEST WILL BE PERFORMED.

PHYSICON INC
3325 TRIANA BLVD - STE A
HUNTSVILLE, AL 35805
Program Manager: DR MELVIN PRICE
Contract #:
Title: SCINTILLATION DETECTOR SYSTEM
Topic #: N90-190 Office: NSWC ID #: 40965

AN INNOVATIVE NEW SENSOR IS PROPOSED TO MEASURE BOTH THE SPECTRAL AND TEMPORAL OUTPUT OF LARGE FLASH X-RAY MACHINES OPERATED BY NSWC. USING MULTIPLE SCINTILLATION DETECTORS OPERATING IN PARALLEL, THE PROPOSED INSTRUMENT WILL BE ABLE TO RESOLVE SPECTRAL FEATURES ALL THE WAY UP TO 1.3 MeV WHILE PROVIDING TIME RESOLUTION OF 1 ns OR BETTER. BY ANALYZING EACH SHOT OF THE FXR, EXPERIMENTERS WILL BE ABLE TO BETTER UNDERSTAND AND QUANTIFY MANY PHYSICAL PHENOMENA CURRENTLY NOT WELL KNOWN. THIS WILL SIGNIFICANTLY IMPROVE THE SIMULATION CAPABILITIES OFFERED BY NSWC AND SHOULD LEAD TO NEW AND BETTER WAYS OF TESTING MILITARY SYSTEMS TO THE EFFECTS OF HARD X-RAYS. THE PHASE I PROPOSAL AIMS TO DEMONSTRATE FEASIBILITY OF THE CONCEPT TO INCLUDE ACTUAL TESTS AT NSWC, ALBEIT ON A REDUCED CAPABILITY SENSOR. THEN, IF SUCCESSFUL, THE PHASE II PROGRAM WILL DEVELOP, BUILD, AND TEST A COMPLETE SENSOR HAVING A WIDE RANGE OF OPERATION. FOR THE FIRST TIME, THE NAVY WILL HAVE A MEANS FOR COMPLETELY CHARACTERIZING EACH FXR SHOT AS IT OCCURS WHICH WILL HELP MANY DIFFERENT USERS.

EIC LABS INC
111 DOWNEY ST
NORWOOD, MA 02062
Program Manager: TRUNG H NGUYEN
Contract #:
Title: STABLE SILVER OXIDE (AgO) BATTERY ELECTRODE
Topic #: N90-191 Office: NSWC ID #: 40966

ELECTROCHEMICALLY PREPARED (EP) SILVER OXIDE HAS BEEN USED IN PRIMARY RESERVE Zn-SILVER OXIDE BATTERIES BECAUSE OF IT HIGH RATE DISCHARGE CAPABILITY. HOWEVER, THE EP SILVER OXIDE IS THERMALLY UNSTABLE UNDER STORAGE THUS LIMITING THE SHELF LIFE OF THE Zn-AgO BATTERIES AND FORCING MANUFACTURERS TO PERIODICALLY REPLACE THOSE BATTERIES AT GREAT EXPENSE. WE PROPOSE TO DEVELOP A NEW ANODIZATION OF SILVER PLATES FOR MAKING HIGH PURITY AND THEMALLY STABLE ELECTROCHEMICALLY PREPARED SILVER OXIDE (AgO). TO INDUCE THE FORMATION OF PERFECT AgO LATTICE WHICH IS THERMALLY STABLE, WE PROPOSE TO PROCEED THE ANODIZATION AT HIGH TEMPERATURE INSIDE AN AUTOCLAVE SO THAT TEMPERATURE ABOVE THE BOILING POINT OF THE ELECTROLYTE CAN BE REACHED AND TO APPLY REVERSE PULSE ANODIZATION INSTEAD OF STRAIGHT CURRENT ANODIZATION FOR INCREASING THE EFFICIENCY AND QUALITY OF THE AgO FORMATION.

GINER INC
14 SPRING ST
WALTHAM, MA 02254
Program Manager: LARRY SWETTE
Contract #:
Title: STABLE SILVER OCIDE (AgO) BATTERY ELECTRODE
Topic #: N90-191 Office: NSWC ID #: 40967

SILVER OXIDE-ZINC BATTERIES ARE KNOWN FOR THEIR HIGH ENERGY AND POWER DENSITY AND ARE USED IN LIGHTWEIGHT RADIO AND ELECTRONIC EQUIPMENT, SUBMARINES, TORPEDOES AND SPACE APPLICATIONS. AS A PRIMARY RESERVE BATTERY, THIS SYSTEM FINDS APPLICATION IN MISSILES AND OTHER AEROSPACE APPLICATIONS. THIS PHASE I PROPOSAL AIMS TO IMPROVE THE CHEMICAL STABILITY OF DIVALENT SILVER OXIDE ELECTRODES USED PARTICULARLY IN PRIMARY BATTERIES OF THE RESERVE TYPE. THE APPROACH IS TO MINIMIZE THE TRANSITION METAL IMPURITIES IN THE POSITIVE PLATE AND TO IMPLEMENT THE HIGH-TEMPERATURE ELECTROCHEMICAL AgO FORMATION PROCESS RECENTLY DEVELOPED AT NSWC. BASED ON THE EXPERIENCE OBTAINED IN LAB-SCALE IMPLEMENTATION OF THE PROCESS, CONDITIONS AND DESIGN REQUIREMENTS FOR PRODUCTION EQUIPMENT FOR PILOT-SCALE MANUFACTURE OF STABLE AgO CATHODES WILL BE PROJECTED. IF THE PHASE I PROGRAM OBJECTIVES ARE MET, THEN IN PHASE II, A PILOT SCALE IMPLEMENTATION WILL BE TESTED BY ASSEMBLING FULL BATTERIES AND CONDUCTING DISCHARGE TESTS AFTER APPROPRIATE AGING.

EIC LABS INC
111 DOWNEY ST
NORWOOD, MA 02062
Program Manager: DR K M ABRAHAM
Contract #:
Title: ACTIVE MINE BATTERIES WITH LONG SHELF-LIFE
Topic #: N90-192 Office: NSWC ID #: 40968

A RESEARCH PROGRAM TO CULMINATE IN THE DEVELOPMENT OF ACTIVE MINE BATTERIES WITH LITTLE OR NO VOLTAGE DELAY AND EXCELLENT CAPACITY RETENTION DURING STORAGE IS PROPOSED. OUR APPROACH INVOLVES THE USE OF Li ANODE OVERLAYERS COMPOSED OF Li+ CONDUCTIVE POLYMER ELECTROLYTES DERIVED FROM DIMENSIONALLY STABILIZED POLY[BIS-(METHOXYETHOXYETHOXIDE)PHOSPHAZENE], KNOWN AS MEEP. LITHIUM SALT COMPLEXES OF THIS POLYMER WILL BE DIMENSIONALLY STABILIZED BY FORMING COMPOSITES WITH POLY-(ETHYLENE OXIDE) OR POLY(ETHYLENE GLYCOL) DIACRYLATE. THE EXPERIMENTAL WORK WILL INVOLVE THE PREPARATION AND CHARACTERIZATION OF DIMENSIONALLY STABILIZED MEEP- BASED THIN FILM ELECTROLYTES ON Li ANODES, FABRICATION AND TESTING OF Li/SOCl2 LABORATORY CELLS, AND PRACTICAL DEMONSTRATION OF THE TECHNOLOGY IN AA-SIZE Li/SOCl2 CELLS.

MIKROS SYSTEMS CORP
3490 U.S. RTE 1 - BLDG 15
PRINCETON, NJ 08540
Program Manager: DR JOSEPH R BURNS
Contract #:
Title: BX1750-A ENHANCEMENTS FOR LOW-POWER DSP
Topic #: N90-193 Office: NSWC ID #: 40969

THIS PHASE I PROGRAM IS DESIGNED TO ENHANCE THE PERFORMANCE OF AN EXISTING MIL-STD-1750A PROCESSOR, THE BX1750A, MANUFACTURED BY THE MICROELECTRONICS DIVISION OF ALLIED SIGNAL. THE METHODOLOGY PROPOSED, TO INCORPORATE THE ENHANCEMENTS FOR DIGITAL SIGNAL PROCESSING (DSP), MAKES EXTENSIVE USE OF THE BUILT-IN-FUNCTION (BIF), AN OPTIONAL FEATURE OF THE 1750A STANDARD, WHEREBY CUSTOMIZED INSTRUCTIONS CAN BE INCORPORATED INTO ON-CHIP MICROCODE ROM AND CALLED BY A SPECIAL OPCODE PLUS EXTENSION. MAJOR TASKS IN PHASE I WILL BE 1. SELECTION OF MAJOR SIGNAL PROCESSING FUNCTIONS TO BE IMPLEMENTED E.G. TRIG FUNCTIONS, FAST FOURIER TRANSFORM, DIGITAL FILTERS, ETC. 2. EVALUATION OF PERFORMANCE OF MICROCODED DSP FUNCTIONS VS. STRAIGHT SOFTWARE SUB-ROUTINE VERSIONS. 3. ADDITION OF SPECIAL HARDWARE SUPPORT FUNCTIONS SUCH AS SINGLE CYCLE MULTIPLY ACCUMULATE, ZERO OVERHEAD LOOPS, ETC. 4. RECOMMENDATIONS FOR PHASE II IMPLEMENTATION OF ENHANCED 1750A CHIP FOR DSP.

WILSON GREATBATCH LTD
10000 WEHRLE DR
CLARENCE, NY 14031
Program Manager: STEVEN J EBEL
Contract #:
Title: PRESSURE TOLERANT LITHIUM BATTERIES
Topic #: N90-194 Office: NSWC ID #: 40970

THE U.S. NAVY HAS A NEED FOR HIGH PRESSURE TOLERANT BATTERIES WITH ENERGY DENSITIES OF 100 Wh/LB AND OPERATIONAL AT OCEAN DEPTHS OF 20,000 FT. CURRENT DEEP OCEAN BATTERY TECHNOLOGY INVOLVES THE USE OF INEFFICIENT HULLS OR CONTAINERS FOR THE PROTECTION OF POWER SOURCES FROM THE HIGH PRESSURE ENVIRONMENTS. WGL PROPOSES TO INVESTIGATE THE FEASIBILITY OF DEVELOPING PRESSURE COMPENSATED CELL CONTAINMENT AND UTILIZING THIS TECHNOLOGY IN CONJUNCTION WITH LITHIUM (Li) PRIMARY CELL SYSTEMS TO MAXIMIZE ENERGY DENSITY. TWO LITHIUM CELL SYSTEMS WILL BE INVESTIGATED: (i) Li/CSC (CHLORINATED SULFURYL CHLORIDE) AND (ii) Li/CFx (CARBON MONOFLUORIDE). THE METHOD OF PRESSURE COMPENSATION TO BE INVESTIGATED WILL BE INCORPORATION OF BELLOWS INTO THE CELL CONTAINER FOR EQUALIZATION OF INTERNAL AND EXTERNAL PRESSURE. THE EXPERIMENTS WILL FOCUS ON THE DEVELOPMENT OF PROTOTYPE CELLS OF THE TWO LITHIUM CHEMISTRIES AND THE PERFORMANCE OF ELECTRICAL DISCHARGE TESTING AT BOTH ATMOSPHERIC PRESSURE AND 10,000 psi. AS A RESULT OF THIS EFFORT, A RECOMMENDATION WILL BE MADE AS TO THE FEASIBILITY OF SUCCESSFUL PHASE II DEVELOPMENT, AND THE APPROACH TO BE TAKEN.

XEDAR CORP
2500 CENTRAL AVE
BOULDER, CO 80301
Program Manager: HANS R BUCHER
Contract #:
Title: UAV COMPATIBLE SENSOR PROCESSING AND COMMUNICATION SYSTEM
Topic #: N90-195 Office: NSWC ID #: 40971

THE CAPABILITY OF UNMANNED AERIAL VEHICLE MOUNTED PYROELECTRIC THERMAL IMAGING SYSTEM TO DETECT SHIPS FROM ALTITUDES OF 25,000 FEET AT SPEEDS OF 120 KNOTS IS ANALYZED. THE SYSTEM

PERFORMANCE INFORMATION IS PRESENTED IN NOMOGRAM FORM TOGETHER WITH INFORMATION ON THE PROBABILITY DETECTION, THE FALSE ALARM RATE, FOR VARIOUS RANGES, ATMOSPHERIC CONDITIONS AND TARGET TO BACKGROUND CONDITIONS. BACKGROUND CLUTTER SUPPRESSION TECHNIQUES AND DATA COMPRESSION METHODS WITH INFORMATION STORAGE AND ON DEMAND TRANSMISSION ARE PRESENTED. A COMPREHENSIVE SYSTEM SPECIFICATION WITH COST INFORMATION IS PRESENTED. AREAS OF CONCERN IN TERMS OF PERFORMANCE ARE IDENTIFIED, AND A SYSTEM MTBF IS CALCULATED.

ARLINGTON TECHNICAL SERVICES
35 CHESTER ST
MALDEN, MA 02148
Program Manager: W WILLIAM HARVEY
Contract #:
Title: MITIGATION OF ELECTROLYTIC CORROSION IN ELECTRONIC COOLING SYSTEMS
Topic #: N90-196 Office: NSWC ID #: 40973

IT IS PROPOSED TO ELUCIDATE ELECTROLYTIC CORROSION IN COOLING SYSTEMS OF THE TYPE EMPLOYED ON NAVY SHIPS FOR HIGH-POWER ELECTRONIC EQUIPMENT. DURING TRANSMISSION, VERY HIGH PULSED DC VOLTAGE DIFFERENCE IS EXPERIENCED BY OPPOSITE METAL HOSE FITTINGS, IN CONTACT WITH DEIONIZED WATER COOLANT. ANOMALOUSLY HIGH RATES OF CORROSION NECESSITATE AN EXPENSIVE FITTING AND HOSE REPLACEMENT PROGRAM. A MAJOR STEP TOWARD A COMPREHENSIVE SOLUTION TO THE ELECTROLYTIC CORROSION PROBLEM WILL BE MADE BY FORMULATING A THEORETICAL FRAMEWORK AND PREDICTIVE MODEL FOR COMPARISON WITH OBSERVATION AND RESULTS OF EXPERIMENTAL TEST WORK. IN ADDITION TO GENERAL CORROSION SCIENCE AND PASSIVITY, RELEVANT TECHNICAL AREAS THAT WILL BE DRAWN UPON INCLUDE ELECTROCHEMICAL REACTIONS AND HYDRODYNAMICS, ANODIZATION BEHAVIOR, AND ELECTROLYTIC CAPACITORS AND LEAKAGE CURRENT, WITH PARTICULAR ATTENTION TO EFFECTS OF VOLTAGE MODULATION. TESTING UNDER SIMULATED SERVICE CONDITIONS WILL BE DONE TO EVALUATE POSSIBLE MITIGATION MEASURES, INCLUDING ALTERNATIVE HOSE FITTING COMPOSITIONS AND MODIFICATIONS TO THE COOLANT. PROMISING MITIGATIONN MEASURES WILL BE PROPOSED FOR EVALUATION BY THE NAVY OR FOR FURTHER DEVELOPMENT IN A FOLLOW-ON PROGRAM.

GINER INC
14 SPRING ST
WALTHAM, MA 02254
Program Manager: NANCY KACKLEY
Contract #:
Title: COOLING WATER CORROSION MECHANISMS AND CONTROL IN HIGH VOLTAGE TUBES
Topic #: N90-196 Office: NSWC ID #: 40972

CORROSION IN HIGH PURITY, LOW CONDUCTIVITY WATER WILL BE INVESTIGATED BY ELECTROCHEMICAL METHODS INCLUDING POLARIZATION RESISTANCE, IMPEDANCE SPECTROSCOPY AND GALVANIC COUPLES. ROTATING ELECTRODE AND MICROELECTRODE METHODS WILL BE USED TO EVALUATE THE EFFECT OF SEVERAL VARIABLES ON THE CORROSION RATE AND MECHANISM. THE VARIABLES TO BE INVESTIGATED INCLUDE METAL TYPE, VOLTAGE GRADIENTS, WATER CHEMISTRY AND CONDUCTIVITY, FLOW VELOCITY AND DISSOLVED OXYGEN. THE OVERALL GOAL IS TO DESCRIBE THE CORROSION MECHANISM CAUSING THE FAILURE OF COOLING WATER HOSE FITTINGS ON HIGH VOLTAGE TUBES AND TO UNDERSTAND THE INFLUENCE OF THE ABOVE VARIABLES ON THE CORROSION RATE. THE METALS TO BE INVESTIGATED WILL INCLUDE TITANIUM, STEEL AND COPPER. ALTERNATE HOSE FITTING DESIGNS AND/OR MATERIALS WILL BE PROPOSED BASED ON THE RESULTS OF THIS INVESTIGATION.

KDC TECHNOLOGY CORP
2011 RESEARCH DR

LIVERMORE, CA 94550
Program Manager: DR RAY J KING
Contract #:
Title: MICROWAVE TESTING OF CARBON FIBERS
Topic #: N90-197 Office: NSWC ID #: 40974

THE GOAL OF THIS EXPLORATORY RESEARCH IS TO DEMONSTRATE THE FEASIBILITY OF USING INNOVATIVE MICROWAVE SENSORS AND MEASUREMENT TECHNIQUES TO NONDESTRUCTIVELY MONITOR VARIATIONS IN THE ELECTRICAL CONDUCTIVITY OF SINGLE AND MULTIFILAMENT CARBON FIBERS ON-LINE IN REAL TIME. THE CONDUCTIVITY IS OF DIRECT INTEREST IN END USE APPLICATIONS INVOLVING ELECTRICAL CONDUSTORS AND ELECTROMAGNETIC SHIELDING. BUT THE ELECTRICAL CONDUCTIVITY IS ALSO A SENSITIVE DIAGNOSTIC INDICATOR OF THE TENSILE MODULUS AND THERMAL CONDUCTIVITY. AT MICROWAVE FREQUENCIES, LOCAL INDUCTIVE COUPLING TO THE FIBERS BECOMES FEASIBLE, THEREBY AVOIDING PROBLEMS ASSOCIATED WITH CONDUCTIVE CONTACT TO THE FIBERS AND WITH FIBER TREATMENTS. THIS OPENS THE POSSIBILITY OF ON-LINE REAL-TIME MONITORING OF THE ELECTRICAL AND THERMAL CONDUCTIVITIES, AS WELL AS THE TENSILE MODULUS. THESE SENSORS ARE EXTREMELY SENSITIVE TO SMALL VARIATIONS IN THE CONDUCTIVITY, AND CAN BE DESIGNED FOR USE OVER DYNAMIC RANGES COVERING SEVERAL ORDERS OF MAGNITUDE CHANGE IN THE CONDUCTIVITY. THEY CAN BE USED IMMEDIATELY AFTER CARBONIZING, AFTER SURFACE TREATMENT, AFTER EPOXY SIZING OR BEFORE WEAVING AND LAYUP BY THE END USER.

OPTRA INC
66 CHERRY HILL DR
BEVERLY, MA 01915
Program Manager: DAVID VOORHES
Contract #:
Title: DEVELOPMENT OF TEST METHODS FOR GRAPHITE FIBERS
Topic #: N90-197 Office: NSWC ID #: 40975

ESTABLISHMENT OF A SET OF COMPREHENSIVE TEST METHODOLOGIES FOR DIRECTLY CHARACTERIZING STRAIN BEHAVIOR IN GRAPHITE FIBERS AND FILAMENTS WITH A NON-CONTACTING LASER EXTENSOMETER IS PROPOSED. THESE METHODS WILL ALLOW RESEARCHERS TO BETTER CALCULATE ELASTIC MODULUS, ELASTIC LIMITS, YIELD POINTS, ULTIMATE STRAIN, AND CONSTRUCT STRESS/STRAIN CURVES FOR INDIVIDUAL GRAPHITE FILAMENTS AND FIBERS BUNDLES. THE PROGRAM WILL DEVELOP LASER EXTENSOMETER TEST METHODS FOR CYCLIC AND MONOTONIC (OBSERVING ELASTIC AND PERHAPS PLASTIC BEHAVIOR) LOADING CONDITIONS, VARIOUS GRAPHITE SPECIMEN GEOMETRIES, AND TESTING WITH AN ENVIRONMENTAL CHAMBER. THE RAPID DEVELOPMENT OF NEW COMPOSITE SYSTEMS UTILIZING GLASS OR GRAPHITE REINFORCING FILAMENTS HAS MADE IT NECESSARY FOR RESEARCHERS TO USE NON-CONTACTING, OPTICAL EXTENSOMETRY TECHNIQUES. THE LASER EXTENSO- METER IS A POWERFUL RESEARCH TOOL FOR STUDYING STRAIN BEHAVIOR BUT REQUIRES CAREFUL USE AND AN UNDERSTANDING OF PROVEN TEST METHODOLOGIES. THIS PROPOSED PROJECT WILL DEVELOP, THROUGH EXPERIMENTATION AND ANALYSIS, A SET OF COMPREHENSIVE TEST METHODS FOR SETTING-UP A LEASER EXTENSOMETER, ALIGNMENT TECHNIQUES FOR DARK GRAPHITE FILAMENTS (DIAMETER OF > OR - 0.001"), ON-LINE MEASUREMENT TECHNIQUES, DATA ANALYSIS FOR STRESS/STRAIN CURVES, AND ERROR ANALYSIS.

QUANTIC INDUSTRIES INC
990 COMMERCIAL ST
SAN CARLOS, CA 94070
Program Manager: KEN WILLIS
Contract #:
Title: ELECTRONIC SAFE-AND-ARMING DEVICES
Topic #: N90-198 Office: NSWC ID #: 40976

ELECTRONIC SAFE-ARM DEVICES OFFER THE POTENTIAL FOR HIGHER RELIABILITY, INSENSITIVE MUNITIONS CAPABILITY AND LOWER COST THAN CURRENT ELECTROMECHANICAL DEVICES. TO REALIZE THIS POTENTIAL, HOWEVER, IT IS NECESSARY TO MAKE AVAILABLE CERTAIN NONSTANDARD COMPONENTS SUITED TO ESA IMPLEMENTATION AND WHICH ARE RELIABLE AND LOW COST. THIS PROPOSED EFFORT WOULD EXTEND QUANTIC INDUSTRIES ONGOING COMPONENT DEVELOPMENT PROGRAM TO SUPPORT NAVY SPECIFIC ESA REQUIREMENTS.

ONTAR CORP
129 UNIVERSITY RD
BROOKLINE, MA 02146
Program Manager: DR JOHN SCHROEDER
Contract #:
Title: INFRARED BACKGROUND/CLUTTER/TARGET SIGNATURE MODEL
Topic #: N90-199 Office: NSWC ID #: 40977

THE NAVY IS CURRENTLY DEVELOPING FLEET DEFENSE SYSTEMS TO DETECT TARGETS AGAINST A CLUTTER BACKGROUND. THESE SYSTEMS WILL PROVIDE THREAT WARNING AND TARGET TRACK INFORMATION. THE USE OF AN AUTONOMOUS, INFRARED SENSOR (OPERATING IN THE 3-5 um AND 8-12 um SPECTRAL BANDS) TO PERFORM THESE TASKS IS BEING INVESTIGATED. FALSE ALARMS FROM CLOUDS, TERRAIN AND SEA CLUTTER WILL SIGNIFICANTLY LIMIT THE PERFORMANCE OF THESE SYSTEMS. CONSEQUENTLY THESE CLUTTER SOURCES MUST BE QUANTITATIVELY UNDERSTOOD IN ORDER TO DEVELOP SIGNAL PROCESSING TECHNIQUES FOR TARGET DETECTION AND CLUTTER REJECTION. THIS WORK WILL PERFORM THE RESERCH AND IMPLEMENT THE SOFTWARE TO DEVELOP THE NSWC INFRARED SIGNATURE CODE (NISC). SPECIFICALLY WE WILL: DEVELOP INFRARED MODELS FOR TARGETS, BACKGROUNDS, AND CLUTTER; ANALYZE EXISTING IR DATABASES (EG. IRAMMP AND OTHER); DEVELOP A METHODOLOGY TO VALIDATE THE MODEL COMPONENTS; AND INCORPORATE THE MODELS INTO AN INFRARED SCENE GENERATOR (IRSGEN). AT THE CONCLUSION OF PHASE I WE WILL DELIVER TO NSWC A USER INTERACTIVE INFRARED SCENE GENERATOR (IRSGEN) THAT WILL ALLOW THE USER TO COMPOSE "SIMPLE" INFRARED SCENES.

SPECTRAL SCIENCES INC
99 S BEDFORD ST - #7
BURLINGTON, MA 01803
Program Manager: ALEXANDER BERK
Contract #:
Title: INFRARED BACKGROUND/CLUTTER/TARGET SIGNATURE MODEL
Topic #: N90-199 Office: NSWC ID #: 40978

THIS PROPOSAL RESPONS TO THE NEED FOR A PC-BASED SCENE GENERATOR CODE WITH SUFFICIENT ACCURACY FOR PREDICTION OF FIELD INSTRUMENTATION PERFORMANCE. THE STARTING POINT FOR THE PHASE I EFFORT IS THE IRVING MODEL, A MULTI-FACETED TARGET AND BACKGROUND IR IMAGING CODE DEVELOPED BY THE NAVAL WEAPONS CENTER. IRVING CALCULATES INFRARED SCENE RADIANCES INCLUDING TARGET AND CLUTTER EFFECTS. TO ENHANCE THE APPLICABILITY OF THE MODEL TONAVAL SURFACE WARFARE SCENARIOS, AN IMPROVED FINITE CLOUD MODEL AND AN OCEAN SURFACE MODEL WILL BE INCORPORATED INTO IRVING DURING PHASE I. SUBSEQUENTLY, IRVING PREDICTIONS WILL BE TESTED AGAINST EXPERIMENTAL DATA AND A PREVIOUSLY VALIDATED TARGET CODE TO EVALUATE MODEL PERFORMANCE. BASED ON THESE STUDIES, UPGRADES NECESSARY TO MEET SYSTEM PERFORMANCE TESTING STANDARDS WILL BE RECOMMENDED. THE IMPROVED IRVING MODEL RESULTING FROM THE PHASE I EFFORT WILL FORM THE BASIS FOR SUBSEQUENT UPGRADES DURING PHASE II, ESPECIALLY IN THE AREA OF CLUTTER.

ATLANTIC AEROSPACE ELECTRONICS CORP

470 TOTTEN POND RD
WALTHAM, MA 02154
Program Manager: DR VICTOR T TOM
Contract #:
Title: MORPHOLOGY-BASED DETECTION PROCESSING FOR SCANNING IRST SENSOR
Topic #: N90-200 Office: NSWC ID #: 40979

THIS PROPOSAL SEEKS TO ESTABLISH THE FEASIBILITY OF APPLYING NEWLY DEVELOPED MORPHOLOGY-BASED ATR ALGORITHMS TO THE IRST TARGET DETECTION AND TARGET/CLUTTER DISCRIMINATION PROBLEM. THE IMPORTANCE OF THIS UNIQUE APPROACH IS TWOFOLD. FIRST, DETECTION PERFORMANCE CAN BE DRAMATICALLY IMPROVED (OVER TRADITIONAL CFAR TECHNIQUES) FOR THE DETECTION OF TARGETS IN SEVERE BACKGROUND CLUTTER, IN WHICH EXCESSIVE FALSE ALARMS ARE A TYPICAL PROBLEM. SECONDLY, MORPHOLOGY- BASED ALGORITHMS CAN BE IMPLEMENTED IN VERY HIGH-SPEED HARDWARE BECAUSE THE FUNDAMENTAL OPERATIONS INVOLVE ONLY LOGICAL COMPARISONS (MIN AND MAX). THE ADVANTAGES OF THIS APPROACH MAKE IT IDEALLY SUITED FOR PROCESSING LARGE VOLUMES OF IRST DATA AT VERY LOW COMPUTATIONAL AND HARDWARE COST. OVER THE PAST SEVERAL YEARS ATLANTIC AEROSPACE ELECTRONICS CORPORATION HAS DEVELOPED AND DEMONSTRATED THIS MORPHOLOGY-BASED TECHNOLOGY FOR DETECTING NON- RESOLVED AND RESOLVED TARGETS IN HIGH CLUTTER BACKGROUNDS. THIS WORK WAS ACCOMPLISHED IN SEVERAL PROGRAMS SPONSORED BY THE AIR FORCE, IN WHICH BASIC ALGORITHM COMPONENTS WERE DEVELOPED, ALGORITHM PERFORMANCE WAS QUANTIFIED ANALYTICALLY AND THEIR OPERATION WAS VERIFIED EXPERIMENTALLY USING RECORDED REAL DATA. OUR PROPOSAL IS TO TRANSFER THIS EXISTING TECHNOLOGY TO THE SHIPBORNE SCANNING IRST SENSOR SYSTEM. IN PHASE II WE PLAN TO DESIGN AND FABRICATE AN EXPERIMENTAL IRST PROCESSOR AND TO DEMONSTRATE ITS OPERATION IN CONJUNCTION WITH A NAVY IRST SENSOR.

FLUOROCHEM INC
680 S AYON AVE
AZUSA, CA 91702
Program Manager: SCOTT B PRESTON
Contract #:
Title: SYNTHESIS CHEMISTRY AND REACTIONS OF ENERGETIC PHOSPAZENES
Topic #: N90-201 Office: NSWC ID #: 40980

REACTIONS OF TRINITROETHANOL, 2,2,2-FLUORODINITROETHANOL AND 2,2-DINITROPROPANOL WITH HEXACHLOROCYCLOTRIPHOSPHAZENE WILL BE STUDIED WITH THE OBJECTIVE OF SYNTHESIZING THE CORRESPONDING HEXAKIS(NITROALKOXY)CYCLOTRIPHOSPHAZENES. OPTIMUM REACTION CONDITIONS FOR THESE PREPARATIONS WILL BE APPLIED TO SYNTHESIS OF THE CORRESPONDING NITROALKOXY-SUBSTITUTED POLYPHOSPHAZENES FROM LINEAR POLY(DICHLOROPHASPHAZENE).

APPLIED RESEARCH ASSOCS INC
4300 SAN MATEO BLVD NE - STE A220
ALBUQUERQUE, NM 87110
Program Manager: JEROME D YATTEAU
Contract #:
Title: HIGH-SPEED LAUNCHER FOR FRAGMENT SIMULATOR
Topic #: N90-202 Office: NSWC ID #: 40981

AN ECONOMICAL FRAGMENT LAUNCH SYSTEM IS NEEDED TO DUPLICATE WARHEAD FRAGMENT/AIR TARGET ENCOUNTER CONDITIONS ASSOCIATED WITH MODERN AIR TO AIR COMBAT. THE OBJECTIVE OF THIS EFFORT IS TO PROVIDE A DETAILED CONCEPTUAL DESIGN, INCLUDING BUILDING AND OPERATING COST ESTIMATES, FOR A LAUNCH SYSTEM CAPABLE OF PROJECTING METALLIC, PARALLELEPIPED

FRAGMENTS WITH WEIGHTS IN THE RANGE OF 30-250 GRAINS (1.9-16.2 GRAMS) TO SPEEDS IN THE RANGE OF 5000-15000 FT/SEC (1.5-4.6 KM/SEC). THE LAUNCH SYSTEM WILL INCLUDE TECHNIQUES TO CONTROL IMPACT ORIENTATION AND WILL BE DESIGNED FOR AN OPERATING EFFICIENCY OF AT LEAST 2 SHOTS PER DAY FOR TESTS INVOLVING STANDARD IMPACT RESEARCH INSTRUMENTATION. SIZE AND POWER REQUIREMENTS WILL BE MINIMIZED. THE FEASIBILITY AND SYSTEM COSTS ASSOCIATED WITH LAUNCHING FRAGMENTS TO SPEEDS AS HIGH AS 20000 FT/SEC (6.1 KM/SEC) AND WITH WEIGHTS UP TO 500 GRAINS (32.4 GRAMS) WILL ALSO BE DETERMINED.

SCI-SO INC
PO BOX 25446
ALBUQUERQUE, NM 87125
Program Manager: DR ROBERT M WESSELY
Contract #:
Title: SERAT - SYSTEM ENGINEERING REQUIREMENTS ANALYSIS TECHNIQUE
Topic #: N90-203 Office: NSWC ID #: 40982

THE SOFTWARE SYSTEM ENGINEERING PROCESS OF CONVERTING CONCEPTS INTO REQUIREMENTS, AND THEN REQUIREMENTS INTO AN IMPLEMENTED SYSTEM IS BECOMING INCREASINGLY COMPLEX. CURRENT METHODS FALL SHORT OF THEIR OBJECTIVES IN HANDLING THIS COMPLEXITY. STRUCTURED FUNCTIONAL ANALYSIS (SFA) LACKS LINKAGE TO DELIVERABLE PRODUCTS - AN END ITEM MUST BE BUILT. ON THE OTHER HAND, THE NEWER OBJECT ORIENTED REQUIREMENTS ANALYSIS (OORA) AND DESIGN (OOD) DO NOT PROVIDE A SUFFICIENT DEFINITION OF PERFORMANCE - BESIDES WELL DEFINED COMMUNICATIONS, THE OBJECT MUST DO SOMETHING. AND NEITHER METHOD ADDRESSES THE STANDARD LEVELS OF SPECIFICATION - REAL WORLD SYSTEMS ARE AUTHORIZED AND DEVELOPED IN DISCRETE STEPS OR STAGES. TO SOLVE THESE PROBLEMS, SCI-SO IS COUPLING MIL-STD DOCUMENTATION CONCEPTS WITH SFA AND OORA/OOD, ALONG WITH SCI-SO'S SYSTEM EVENT TAXONOMY (SET) INTO A UNIFIED REQUIREMENTS TOOLSET CALLED SERAT (SYSTEM ENGINEERING REQUIREMENTS ANALYSIS TECHNIQUE). SERAT IS AN INNOVATIVE PROCEDURE AND TOOLSET WHICH WILL PERMIT CONTROL AND QUALITY MANAGEMENT OF THE SOFTWARE SYSTEM ENGINEERING PROCESS.

OPTECH LAB
22048 SHERMAN WY - #107
CANOGA PARK, CA 91303
Program Manager: DR SHI-KAY YAO
Contract #:
Title: RUGGEDIZED FIBER OPTIC SWITCHES
Topic #: N90-204 Office: NSWC ID #: 40983

FEASIBILITY STUDY AND DESIGN OF A NEW FAMILY OF RUGGEDIZED FIBER OPTIC SWITCHES ARE PROPOSED. ANALYTICAL AND BREADBOARD EXPERIMENTS WILL BE CONDUCTED FOR EVALUATION OF THE NEW PROPOSED RUGGEDIZED SWITCHES. THE RESULTS OF THE INVESTIGATIONS INCLUDE ALIGNMENT SENSITIVITY, SPEED, EXTINCTION RATIO, SPECTRAL SENSITIVITY, AND EXPECTED RELIABILITY PERFORMANCES WILL BE PRESENTED IN THE FINAL REPORT. ALSO WILL BE INCLUDED IN THE FINAL REPORT IS DESIGN EXAMPLES FOR PHASE II DEVELOPMENT. THE OPERATION AND APPLICATION RANGES OF THIS NEW FAMILY OF RUGGEDIZED FIBER OPTIC SWITCHES, ITS APPLICABILITY FOR MORE ADVANCED DESIGNS SUCH AS 1XN AND NXN SWITCHES WILL ALSO BE INVESTIGATED. THE RESULTS WILL ALSO BE INCLUDED IN THE FINAL REPORT.

PHYSICAL OPTICS CORP
2545 W 237TH ST - STE B
TORRANCE, CA 90505
Program Manager: DR FREDDIE LIN

Contract #:
Title: RUGGED FIBER OPTIC WAVEGUIDE SWITCHES FOR LOCAL AREA NETWORKS
Topic #: N90-204 Office: NSWC ID #: 40984

THIS PROGRAM WILL DEVELOP A RUGGEDIZED FIBER OPTIC SWITCH THAT CAN OPERATE UNDER ENVIRONMENTAL STRESSES. THE SWITCH HAS MAJOR APPLICATIONS FOR LOCAL AREA NETWORKS. THE SWITCH OPERATES ON THE PRINCIPLE OF MODULATION OF THE CUTOFF CONDITION IN WAVEGUIDES BY USING AN ELECTRO-OPTIC CLADDING LAYER BETWEEN TWO GUIDES. IT CAN BE DESIGNED FOR USE WITH MULTIMODE FIBERS WHERE THE TIR CONDITION IN A THICK GUIDING LAYER IS CHANGED TO SWITCH LIGHT BETWEEN TWO SUCH GUIDES, OR FOR SINGLE MODE FIBERS AND WAVEGUIDES, WHERE THE COUPLING CONSTANT BETWEEN TWO GUIDES IS MODULATED. THE DEVICE DOES NOT CONTAIN ANY MOVING PARTS; THUS, IT IS MECHANICALLY STABLE. THERMAL AND HUMIDITY RESISTANCE ARE ENSURED BY SELECTION OF SUITABLE MATERIALS. THE SWITCH ITSELF INTRODUCES MINIMAL LOSSES. COUPLING LOSSES ARE MINIMIZED BY USING HIGHLY EFFICIENT GRATING COUPLERS OR END COUPLING. ANOTHER DESIGN OPTION IS TO REPLACE THE FIBER CLADDING WITH THE ELECTRO-OPTIC MATERIAL AND TO SWTICH DIRECTLY BETWEEN FIBERS. THE FIBER OPTIC SWITCH CAN ALSO BE EXPANDED TO A MULTICHANNEL VERSION. POC'S EXPERTISE IN HOLOGRAPHIC DIFFRACTION GRATINGS ALSO ALLOWS EXTENSION TO MULTI-WAVELENGTH SYSTEMS IN WHICH WAVELENGTH DIVISION MULTIPLEXING/DEMULTIPLEXING IS PERFORMED.

EPITAXX INC
3490 U.S. RTE 1
PRINCETON, NJ 08540
Program Manager: DONALD E ACKLEY
Contract #:
Title: A HIGH POWER 1300 nm LED FOR FIBER OPTIC APPLICATIONS
Topic #: N90-205 Office: NSWC ID #: 40985

WE PROPOSE TO DEVELOP A HIGH POWER 1300 nm LED FOR USE IN NAVY FIBER OPTIC SYSTEMS. THE LED STRUCTURE WILL BE GROWN BY HYDRIDE VAPOR PHASE EPITAXIAL (VPE) TECHNIQUES WHICH HAVE BEEN SHOWN AT EPITAXX TO PRODUCE HIGH QUALITY MATERIAL AND LARGE NUMBERS OF WAFERS. THE INNOVATION CONSISTS OF DRY METHANE ETCHING TO "MACHINE" THE INITIAL STRUCTURE, TOGETHER WITH NOVEL VPE REGROWTH TECHNIQUES TO DEPOSIT SEMI-INSULATING InP CURRENT BLOCKING LAYERS. THE DEVICE STRUCTURE WILL BE FABRICATED BY DRY ETCHING AND REGROWTH TECHNIQUES. THE ACTIVE AREA OF THE DEVICE WILL BE AN INTERRUPED STRIPE STRUCTURE WHICH WILL BE DEFINED BY METHANE ETCHING, A TECHNIQUE THAT HAS SHOWN PRECISE ETCH RATES AND EXCELLENT EDGE DEFINITION IN THE FABRICATION OF AVALANCHE PHOTODIODES AT EPITAXX. CURRENT CONFINEMENT WILL BE ACHIEVED BY EPITAXIAL REGROWTHOF InP TO YIELD SEMI-INSULATING CURRENT BLOCKING LAYERS. VARIOUS DEVICE GEOMETRIES WILL BE INVESTIGATED TO OPTIMIZE THE OUTPUT POWER OF THE DEVICE AND TO PREVENT LASING OVER THE ENTIRE RANGE OF OPERATING TEMPERATURES. PHASE I GOALS INCLUDE CONSTRUCTION OF A DEVICE WITH A LEAST 3 mW OUTPUT AT ROOM TEMPERATURE. PHASE II GOALS INCLUDE OPTIMIZATION OF DEVICE STRUCTURES TO ACHIEVE NARROW FAR FIELD PATTERNS, COMPLETE SUPPRESSION OF LASING AND DELIVERY OF DEVICES WHICH LAUNCH MORE THAN -12dBm PF 1300 nm OPTICAL POWER INTO SINGLE MODE FIBER AND -5dBm INTO 62 um CORE MULTI-MODE OPTICAL FIBER WITH LESS THAN A FACTOR TEN VARIATION IN COUPLED POWER FROM -28 TO +85C.

MRV TECHNOLOGIES INC
8917 FULLBRIGHT AVE
CHATSWORTH, CA 91311
Program Manager: DR SHLOMO MARGALIT
Contract #:
Title: HIGH-POWER FIBER OPTIC SOURCES

Topic #: N90-205 Office: NSWC ID #: 40986

THIS PROPOSAL DESCRIBES AN EFFORT TOWARDS DEVELOPING AN OPTICAL SOURCE THAT WILL BE USEFUL IN DIFFERENT FIBER-OPTIC COMMUNICATION NETWORKS. THE DEVICE PROPOSED HERE IS A HIGH POWER E-LED AT 1300nm OPTIMIZED FOR WIDE OPERATING TEMPERATURE RANGE. THE DEVELOPMENT WILL HAVE TWO DISTINCT FOCI: (a) OPTIMIZATION OF THE LED CHIP FOR THE BEST FACET POWER PERFORMANCE; AND (b) DEMONSTRATION OF A PACKAGE THAT WILL ENABLE COUPLING -12dBm AT THE WIDEST TEMPERAATURE RANGE. SINCE HIGH POWER, WHEN ACHIEVED THROUGH STRONG GAIN, IS USUALLY CONTRADICING WIDE OPERATING TEMPERATURE RANGE, AN EFFORT WILL HAVE TO BE MADE TO FIND AN OPTIMUM CHIP STRUCTURE. MRV TECHNOLOGIES, INC.'S BASIC P-SUBSTRATE BURIED-CRESCENT LASER STRUCTURE WILL MAKE UP FOR THE GAIN UNIT PART OF THE PROPOSED E-LED AND ENGINEERING OF GAIN TO DIFFRACTION RATIO WILL BE THE MAIN TOOL TO OPTIMIZE THE DIFFERENT DESIRE SPECS SIMULTANEOUSLY.

A&D ASSOCS (c/o KRAFT)
46 WALNUT PL
BRIARCLIFF MANOR, NY 10510
Program Manager: DR LLOYD MOTZ
Contract #:
Title: FUSION OF DEUTERIUM AND LITHIUM NUCLEI IN A PALLADIUM LATTICE
Topic #: N90-207 Office: NSWC ID #: 41169

THE CLAIM OF FLEISCHMANN AND PONS TO HAVE ACHIEVED "COLD FUSION" IN A PALLADIUM CRYSTAL LATTICE SATURATED WITH LITHIUM HYDRIDE (DEUTERIDE) HAS STIMULATED MUCH DISCUSSION. ALTHOUGH THEY HAVE AN UNEXPLAINED ENERGY SOURCE, THERE EXIST NO SATISFACTORY FUSION MODELS THAT CAN ACCOUNT FOR THEIR OBSERVATIONS. WE PROPOSE TO STUDY THE QUANTUM AND STATISTICAL MECHANICS OF VARIOUS MECHANISMS FOR NUCLEAR FUSION IN A PALLADIUM LATTICE. OUR STUDY TAKES INTO ACCOUNT THE PRESENCE OF BOTH LITHIUM AND DEUTERIUM AND PROVIDES AN EXHAUSTIVE AND IN-DEPTH ANALYSIS OF ALL PATHS THAT COULD LEAD TO A COLD FUSION INTERPRETATION OF THE FLEISCHMANN AND PONS EXPERIMENT. THE MECHANISMS TO BE STUDIED INCLUDE THE DIRECT FUSION OF DEUTERIUM NUCLEI, THE FUSION OF A DEUTERON WITH A PROTON, THE INTERACTION OF THE LITHIUM NUCLEUS WITH A DEUTERON, THE ENHANCED EFFECTIVE MASS OF AN ELECTRON IN A PALLADIUM LATTICE, AND THE STRIPPING OF A DEUTERON BY A PALLADIUM NUCLEUS.

AMERICAN RESEARCH CORP OF VA
PO BOX 3406
RADFORD, VA 24143
Program Manager: DR M G NIIMURA
Contract #:
Title: POLARON INDUCED RESONANCE MECHANISMS OF DEUTERIUM-LITHIUM FUSION IN A CRYSTALLINE PALLADIUM LATTICE
Topic #: N90-207 Office: NSWC ID #: 40987

CONVENTIONAL FUSION PROCESSES ARE NOT EXPECTED TO ACHIEVE BREAK-EVEN WITHIN THE NEXT DECADE. COLD FUSION IS AN EXCITING OPTION, SINCE IT OFFERS AN INEXPENSIVE ALTERNATIVE AND SOME CLAIM BREAK-EVEN HAS ALREADY BEEN ACHIEVED. HOWEVER, TO DAT, NO IN-DEPTH THEORETICAL STUDY OF COLD FUSION HAS BEEN CONDUCTED. LOW NEUTRON FLUX AND THE USE OF LITHIUM HYDROXIDE AS AN ELECTROLYTE IN THE FUSION CELLS USED BY FLEISCHMAN AND PONS INDICATES THAT DEUTERIUM-LITHIUM (D-Li) FUSION COULD BE OCCURRING IN THEIR EXPERIMENTS. ELECTRONS WITH ENHANCED MASS EXIST IN METALLIC CRYSTALLINE LATTICES SUCH AS PALLADIUM (Pd). SIMILARLY, MUONS WHICHARE EQUIVALENT TO HEAVY ELECTRONS, ARE KNOWN TO CATALYZE FUSION REACTIONS. RESONANCE FUSION MECHANISMS ARE TWO ORDERS OF MAGNITUDE FASTER THAN

NON-RESONANT MECHANISMS IN MUON CATALYZED FUSION EXPERIMENTS. THE APPROACH PROPOSED IN THIS THEORETICAL STUDY IS TO INVESTIGATE THE ACTUAL SIMILARITIES BETWEEN COLD AND MUON CATALYZED FUSIONS. PHASE I OBJECTIVES INCLUDE MODELING OF ION DIFFUSION AND ABSORPTION IN Pd, DETERMINATION OF ION DIFFUSION AND ABSORPTION IN Pd, IDENTIFICATION OF DEUTERIUM-LITHIUM FUSION MECHANISMS AND DLi ION FORMATION, AND ANALYSIS OF DEUTERIUM-LITHIUM FUSION IN THE PALLADIUM CRYSTALLINE LATTICE. SUCCESSFUL COMPLETION OF THE PROGRAM WOULD RESULT IN A THEORY OF D-Li FUSION THAT WOULD LEAD TO THE DEVELOPMENT OF COLD FUSION AS A SOURCE OF PROPULSION. THE PROGRAM INNOVATION IN THE USE OF RESONANCE MECHANISMS IN COLD FUSION THEORY.

VIGYAN INC
30 RESEARCH DR
HAMPTON, VA 23666
Program Manager: DR RAM K TRIPATHI
Contract #:
Title: PLAUSSIBILITY OF COLD FUSION IN METALIC LATTICE
Topic #: N90-207 Office: NSWC ID #: 40988

COLD FUSION OCCURS WHEN TWO NUCLEI WITH VERY SMALL RELATIVE ENERGY TUNNEL THROUGH THEIR RELATIVE COULOMB BARRIER TO INITIATE A NUCLEAR REACTION. RECENT REPORTS OF COLD-FUSION BETWEEN HYDROGEN ISOTOPES EMBEDDED IN PALLADIUM AND TITANIUM HAVE AROUSED A LOT OF ACTIVITY IN THIS AREA. TO ACHEIVE THE RATE OF NEUTRON PRODUCTION (~10(-23s-1) PER DEUTERON PAIR) REQUIRES THE SOLID STATE ENVIRONMENT TO PRODUCE EITHER AN UNUSUAL ENHANCEMENT OF FUSION REACTION RATE OR A LARGE SUPPRESSION OF COULOMB BARRIER BETWEEN DEUTERONS. AS OF NOW THERE IS NO RELIABLE THEORY WHICH CAN CALCULATE THE FUSTION REACTION RATES IN LATTICE. WE PROPOSE TO DEVELOP A RELIABLE THEORY FOR THIS PURPOSE USING QUANTUM AND STATISTICAL MECHANICS FOR WHICH WE HAVE GREAT EXPERIENCE AND EXPERTISE. WE WILL DEVELOP THEORY TO CALCULATE RELIABLE POTENTIAL AND WAVE FUNCTIONS OF DEUTERIUM AND LITHIUM IN PALLADIUM LATTICE AND DEVELOP THEORIES FOR ELECTRON SCREENING AND MANY-BODY FLUCTUATIONS. THE POSSIBILITY OF THE PRESENCE OF EXOTIC PHENOMENA WILL BE STUDIED. ESTIMATES BASED ON OUR THEORY WILL GIVE DEFINITIVE ANSWERS TO THIS HIGHLY DEBATED AND MOST INTERESTING TOPIC.

MISSION RESEARCH CORP
8560 CINDERBED RD
NEWINGTON, VA 22122
Program Manager: JOHN A PASOUR
Contract #:
Title: DESIGN AND DEVELOPMENT OF A TWO-STAGE FEL FOR THE NSWC THOR GENERATOR
Topic #: N90-208 Office: NSWC ID #: 40989

THE GOAL OF THE PROPOSED PROGRAM IS TO DEVELOP A HIGH-POWER FREE-ELECTRON LASER (FEL) TO BE DRIVEN BY A NEW ELECTRON ACCELERATOR AT NSWC. THIS ACCELERATOR, CALLED THOR, IS CAPABLE OF OPERATION AT 3 MV AND 1 kA FOR A DURATION OF 1 MICROSEC. AN EFFICIENT (FEL) FOR THIS ACCELERATOR WOULD CONSEQUENTLY BE CAPABLE OF AN EXTREMELY HIGH PEAK POWER (~1 GW) AND ENERGY PER PULSE (~1 kJ). DURING PHASE I OF THE PROGRAM, WE PROPOSE TO DESIGN A TWO-STAGE FEL THAT IS OPTIMIZED FOR OPERATION ON THOR. A TWO-STAGE DEVICE UTILIZES THE HIGH-POWER OUTPUT OF THE FIRST STAGE, WHICH IS A CONVENTIONAL FEL, TO DRIVE A HIGHER FREQUENCY INTERACTION IN THE SECOND STAGE. FOR MAXIMUM FLEXIBILITY, WE PROPOSE TO DESIGN A SYSTEM THAT CAN COUPLE OUT EITHER THE FIRST STAGE OUTPUT (F~-300 GHz) OR THE SECOND STAGE OUTPUT (f~1-30 THz). THE PROGRAM WILL ADDRESS SEVERAL KEY ISSUES, INCLUDING THE QUALITY OF THE THOR ELECTRON BEAM AND THE LIMITATIONS IT IMPOSES ON FEL OPERATION, EFFICIENCY ENHANCEMENT OF BOTH THE FIRST AND SECOND STAGES, AND THE DESIGN OF A WIGGLER AND

RESONATOR FOR THE FEL. THE FABRICATION AND TESTING OF THESE COMPONENTS AND THEIR INSTALLATION AT NSWC WILL BE PERFORMED DURING PHASE II.

MANAGEMENT COMMUNICATIONS & CONTROL INC
2000 N 14TH ST - STE 220
ARLINGTON, VA 22201
Program Manager: CHRISTOPHER B ROBBINS
Contract #:
Title: PROGRAMMABLE LINEAR DIGITAL BEAMFORMER
Topic #: N90-209 Office: NSWC ID #: 41170

ADVANCES IN PROGRAMMABLE SIGNAL PROCESSING HARDWARE AND THE DEVELOPMENT OF TECHNIQUES FOR OPTIMIZING SIGNAL PROCESSING ALGORITHMS TO ACHIEVE HIGH PROCESSOR THROUGHPUT RATES HAVE MADE IT POSSIBLE TO DEVELOP A PROGRAMMABLE, LINEAR DIGITAL BEAMFORMER WITH THE FLEXIBILITY TO MEET A WIDE RANGE OF BEAMFORMING OBJECTIVES AT A REASONABLE COST. THE PROPOSAL PRESENTS AN APPROACH WHICH WOULD EMPLOY HIGH THROUGHPUT 32 BIT DIGITAL SIGNAL PROCESSORS, ARRAY PROCESSORS WITH UP TO 80 MFLOP EXECUTION RATES, A/D CONVERTERS WITH INTERNAL MULTIPLEXING, AND HIGH DENSITY, MULTI-PORT MEMORY CHIPS FOR PRODUCING A HIGH THROUGHPUT, YET PROGRAMMABLE, DIGITAL BEAMFORMER THAT IS VME BUS COMPATIBLE. TO AUGMENT THE HARDWARE, IT IS PROPOSED THAT THE LATEST TECHNIQUES DEVELOPED BY THE NAVY FOR MAXIMIZING HARDWARE THROUGHPUT ON ITS STANDARD REAL-TIME SIGNAL PROCESSORS BE APPLIED TO TAILOR THE SIGNAL PROCESSING ALGORITHMS TO THE HARDWARE. USING DATA FLOW PROGRAMMING TECHNIQUES AND SPECIAL PURPOSE ALGORITHMS, THE OVERHEAD ASSOCIATED WITH PROGRAMMABLE APPLICATIONS CAN BE MINIMIZED, THEREBY MAXIMIZING THE PROCESSING THROUGHPUT. PHASE I OF THIS PROJECT WOULD ESTABLISH THE PROCESSING REQUIREMENTS FOR THE BEAMFORMER AND MATCH THOSE REQUIREMENTS TO A HARDWARE ARCHITECTURE. PHASE II WOULD FABRICATE A PROTOTYPE OF THE PHASE I SPECIFIED BEAMFORMER.

GEO-CENTERS INC
7 WELLS AVE
NEWTON CENTRE, MA 02159
Program Manager: DR ANDREW LAZAREWICZ
Contract #:
Title: NON-ACOUSTIC UNDERWATER INFLUENCE SENSOR
Topic #: N90-211 Office: NSWC ID #: 40991

GEO-CENTERS, INC. PROPOSES TO DESIGN, DEVELOP AND TEST A NOVEL TOTAL MAGNETIC FIELD SENSOR SYSTEM THAT WILL ULTIMATELY DETECT SUBMARINES AND SHIPS AT LARGE STAND-OFF DISTANCES. A PROPRIETARY SINGLE-AXIS, MAGNETIC FIELD SENSOR HAS BEEN DEVELOPED AND DEMONSTRATED BY GEO- CENTERS, INC. WHICH UNIQUELY COMBINES HIGH SENSITIVITY WITH EXTREME SIMPLICITY, RELIABILITY, RUGGEDNESS, COMPACT SIZE AND LOW COST. THIS SINGLE-AXIS SENSOR WHICH HAS ALREADY BEEN PROVEN BY GEO-CENTERS, INC. IN VARIOUS APPLICATIONS WILL BE THE BASIS FOR DEVELOPING A TOTAL (THREE-AXS) FIELD MAGNETOMETER. THIS PHASE I SMALL BUSINESS INNOVATIVE RESEARCH (SBIR) PROGRAM WILL ALSO ANALYTICALLY ESTIMATE AND EXPERIMENTALLY DEMONSTRATE THE ABILITY OF THE TOTAL FIELD MAGNETIC SENSOR TECHNOLOGY TO DETECT LARGE TARGET VESSELS AT CONSIDERABLE DISTANCES. ESTIMATED MAGNETIC INFLUENCE OF TARGET VESSELS WILL BE ANALYTICALLY DETERMINED AND DETECTION RANGE WILL BE ESTIMATED BASED ON MAGNETIC INFLUENCE SIZE AND SENSOR CAPABILITY. THE MAGNETOMETER IS APPLICABLE TO BEING INCORPORATED INTO AN ARRAY WHICH CAN LOCATE, CLASSIFY, AND TRACK TARGET VESSELS.

DESIGN ENGINEERING INC
4725 LUMBER AVE NE - STE #1

ALBUQUERQUE, NM 87109
Program Manager: HANS J TAUSCH JR
Contract #:
Title: RADIATION HARDENED ROBOT POSITIONER FOR TEST SAMPLES IN PROTON EXPERIMENTS
Topic #: N90-212 Office: NWSC ID #: 40992

A ROBOTIC POSITIONER WILL BE DEVELOPED FOR HANDLING AND CHANGING DEVICES TO BE TESTED (DUTs) IN HAZARDOUS RADIATION ENVIRONMENTS SUCH AS THAT FOUND INSIDE THE TEST CELL OF THE BROOKHAVEN NATION LABORATORY PROTON ACCELERATOR. PRESENTLY, PERSONNEL SAFETY INDICATES A LONG "COOLING" TIME BEFORE TEST FIXTURES CAN BE ACCESSED. THIS RESULTS IN LOWERED FACILITY USEFULNESS, INCREASED REAL FACILITY COSTS AND CONSIDERABLE FRUSTRATION FOR USERS. THIS POSITIONER WILL GREATLY LOWER TURN-AROUND TIME BETWEEN TESTS AND SIMULTANEOUSLY INCREASE PERSONNEL SAFETY.

MISSION RESEARCH CORP
1720 RANDOLPH RD SE
ALBUQUERQUE, NM 87106
Program Manager: DAVID R ALEXANDER
Contract #:
Title: INSTRUMENTATION OF LOGIC UPSET DETECTION IN TRANSIENT ENVIRONMENTS
Topic #: N90-213 Office: NWSC ID #: 40993

A TEST INSTRUMENTATION SYSTEM IS PROPOSED FOR THE DETECTION AND ISOLATION OF UPSET FAULTS PRODUCED BY TRANSIENT RADIATION IN VHSIC CLASS ASICs AND GENERAL PURPOSE MICROCIRCUITS. THE PROPOSED SYSTEM IS COMPOSED OF A HIGH SPEED WORK STATION, A PORTABLETESTER, AND A SEPARABLE TEST HEAD CONTAINING THE DEVICE UNDER TEST TO BE PLACED IN THE RADIATIONN BEAM. THE WORK STATION ACTS AS A CONTROLLER FOR THE TESTER. IT ALSO SERVES AS A PLATFORM FOR SOFTWARE PROGRAMS TO AID IN THE SELECTION OF TEST VECTORS, THE SIMULATION OF MICROCIRCUIT PERFORMANCE, AND THE ISOLATION OF CIRCUIT ELEMENTS RESPONSIBLE FOR THE FAULT. A VHDL DESCRIPTION OF THE MICROCIRCUIT IS THE BASIS FOR THE SIMULATION AND DIAGNOSTIC ALGORITHMS. THE PROPOSED TESTER INCLUDES PROVISIONS FOR BOUNDARY SCAN TESTING AS DEFINED BY THE PROPOSED IEEE STANDARD 91149.1. THE PROPOSED TEST HEAD DESIGNS INCLUDES PROVISIONS FOR TYPICAL ASIC PACKAGE TYPES. IT WILL BE DESIGNED TO PERMIT ALIGNMENT WITH THE RADIATION BEAM AND TO ACCOMMODATE DOSIMETRY. PHASE I ACTIVITIES WILL INCLUDE FEASIBILITY STUDIES WHICH WILL SERVE AS THE BASIS FOR A DETAILED DESIGN AND FABRICATION OF THE SYSTEM IN PHASE II.

APA OPTICS INC
2950 NE 84TH LN
BLAINE, MN 55434
Program Manager: DR STEVEN M ARNOLD
Contract #:
Title: HOLOGRAPHIC INTERFEROMETER FOR OPTICAL MEASUREMENT
Topic #: N90-214 Office: NWC ID #: 41171

MULTISPECTRUM GUIDANCE SYSTEMS ARE BEING DEVELOPED WHICH CONTAIN EXTREMELY SMALL, NON-SPHERICAL OPTICAL COMPONENTS FOR LONG WAVELENGTH IR SEEKERS. THE NAVY REQUIRES A NONCONTACT METHOD OF TESTING THESE PARTS FOR CONFORMANCE TO SPECIFICATIONS PRIOR TO THEIR ASSEMBLY INTO THE SYSTEM. APA OPTICS PROPOSES TO DEVELOP AN OPTICAL INTERFEROMETER WHICH WILL USE LOW COST COMPUTER GENERATED HOLOGRAMS (CGH) AS NULL LENSES. AN ALTERNATIVE APPROACH IS THE LASER STYLUS PROFILOMETER WHICH USES A FOCUSED LASER BEAM TO LABORIOUSLY SAMPLE A TEST SURFACE MOUNTED ON A 3-AXIS TRANSLATION STAGE. BY COMPARISON, AN OPTICAL INTERFEROMETER OFFERS THE ADVANTAGES OF RAPID, FULL APERTURE TESTING OF NOMINALLY

IDENTICAL PARTS FOLLOWING AN INITIAL SETUP. MOREOVER, THE OPTICAL INTERFEROMETER CAN BE CONFIGURED TO DIRECTLY MEASURE OPTICAL PERFORMANCE, WHEREAS AN OPTICAL PROFILOMETER CAN ONLY MEASURE SURFACE ACCURACY. AFTER STUDYING THE TESTING REQUIREMENTS, APA OPTICS WILL DESIGN A HOLOGRAPHIC INTERFEROMETER TO MEET ALL REQUIREMENTS. THE APPARATUS WILL BE BUILT AND TESTED UNDER PHASE II.

CAPE COD RESEARCH INC
PO BOX 600 - 95 MAIN ST
BUZZARDS BAY, MA 02532
Program Manager: FRANCIS KEOHAN
Contract #:
Title: NOVEL CERAMER-BASED ADHESIVES FOR RADOME FABRICATION
Topic #: N90-215 Office: NWC ID #: 41173

A NEW TYPE OF CERAMER IS PROPOSED WHICH CAN SIGNIFICANTLY IMPROVE ADHESIVE BONDING IN RADOME MANUFACTURE AND REPAIR OPERATIONS. THE PROPOSED RESEARCH EXPLORES THE FEASIBILITY OF MODIFYING SILICATE- BASED CERAMICS WITH NOVEL POLYMERIC TOUGHENING AGENTS TO PRODUCE A NEW CLASS OF HIGH TEMPERATURE ADHESIVE. THE ULTIMATE OBJECTIVE OF THE PROGRAM IS TO DEVELOP AN ADHESIVE WITH GOOD HANDLING CHARACTERISTICS, A MANAGABLE CURING TEMPERATURE, HIGH THERMO- OXIDATIVE STABILITY AND EXCELLENT ADHESION TO METALS AND COMPOSITE MATERIALS. IN THE PROPOSED STUDY, THE METHODOLOGY FOR PREPARING THESE NOVEL CERAMIC HYBRIDS WILL BE DEVELOPED AND SELECTED MATERIALS TESTED FOR ADHESION TO TYPICAL AIRCRAFT AND RADOME SUBSTRATES.

PDA ENGINEERING
3754 HAWKINS NE
ALBUQUERQUE, NM 87109
Program Manager: RONALD E ALLRED
Contract #:
Title: EASILY PROCESSED HIGH TEMPERATURE PRIMER/ADHESIVE SYSTEM
Topic #: N90-215 Office: NWC ID #: 41172

DEVELOPMENT OF REACTIVE PRIMER/MODIFIED PHENOLIC ADHESIVE SYSTEM IS PROPOSED FOR BONDING RADOME MATERIALS. INITIAL STUDIES HAVE SHOWN THAT THE REACTIVE PRIMER CHEMISTRY WILL FORM CHEMICAL BONDS WITH METALS, CERAMICS AND POLYMERS. A TWO-STAGE PRIMER IS PROPOSED THAT CAN BE BONDED TO A RADOME SUBSTRATE AND AN ADHESIVE IN TWO SEPARATE OPERATIONS, EITHER BY TEMPERATURE, ACTINIC LIGHT OR A COMBINATION OF THESE. THE MODIFIED PHENOLIC ADHESIVE HAS EXCELLENT HIGH TEMPERATURE PROPERTIES AND CURES WITHOUT VOLATILE EVOLUTION AT TEMPERATURES NEAR 200 DEG C. THE COMBINATION PRIMER/ADHESIVE SYSTEM CAN BE EASILY PROCESSED TO FORM WELL-ADHERED, HIGH STRENGTH, HEAT RESISTANT JOINTS WITH A VARIETY OF RADOME MATERIALS.

ONTAR CORP
129 UNIVERSITY RD
BROOKLINE, MA 02146
Program Manager: DR JOHN SCHROEDER
Contract #:
Title: INFRARED BACKGROUND MODELING AND ANALYSIS
Topic #: N90-217 Office: NWC ID #: 41174

THE NAVY IS CURRENTLY DEVELOPING FLEET DEFENSE SYSTEMS TO DETECT TARGETS AGAINST A STRUCTURED BACKGROUND. THESE SYSTEMS WILL PROVIDE THREAT WARNING AND TARGET TRACK

INFORMATION. THE USE OF AN AUTONOMOUS, INFRARED SENSOR (OPTERATING IN THE 3-5 um AND 8-12 um SPECTRAL BANDS) TO PERFORM THESE TASKS IS BEING INVESTIGATED. FALSE ALARMS FROM CLOUDS, TERRAIN AND SEA CLUTTER WILL SIGNIFICANTLY LIMIT THE PERFORMANCE OF THESE SYSTEMS. CONSEQUENTLY THESE BACKGROUND SOURCES MUST BE QUANTITATIVELY UNDERSTOOD IN ORDER TO DEVELOP SIGNAL PROCESSING TECHNIQUES FOR TARGET DETECTION AND CLUTTER REJECTION. THIS WORK WILL PERFORM THE RESEARCH AND IMPLEMENT THE SOFTWARE TO DEVELOP THE CLASSES OF STRUCTURED IR BACKGROUND MODELS. SPECIFICALLY WE WILL: ANALYZE EXISTING IR DATABASES (EG. IRAMMP AND OTHER); DEVELOP INFRARED MODELS FOR TARGETS, BACKGROUNDS, AND CLUTTER; DEVELOP A METHODOLOGY TO VALIDATE THE MODEL COMPONENTS; AND INCORPORATE THE MODELS INTO AN INFRARED SCENE GENERATOR (IRSGEN). AT THE CONCLUSION OF PHASE I WE WILL DELIVER TO NWC A WORK PLAN TO CREATE USER INTERACTIVE INFRARED SCENE GENERATOR (IRSGEN) THAT WILL ALLOW THE USER TO COMPOSE MODEL INFRARED SCENES.

SENSCI CORP
1423 POWHATAN ST - STE 6
ALEXANDRIA, VA 22314
Program Manager: THOMAS W CASSIDY
Contract #:
Title: IR BACKGROUND MODELING AND ANALYSIS
Topic #: N90-217 Office: NWC ID #: 41175

THE PROPOSAL ENCOMPASSES THE DEVELOPMENT OF BACKGROUND CLASSIFICATION ALGORITHMS THAT CAN BE USED TO ASSIST A MODEL OPERATOR TO IDENTIFY THE BACKGROUND ELEMENTS FOR AN EXISTING INFRARED SIGNATURE MODEL. WE ALSO PROPOSE TO EXTEND THE MODEL TO THOSE AREAS OF PREDICTION THAT HAVE NOT BEEN DEVELOPED FOR THIS MODEL. ANTICIPATED AREAS OF MODEL EXTENSION IS IN THE PREDICTION OF SEA SIGNATURES AND TARGETS ON IN THE SEA ENVIRONMENT.

AMHERST SYSTEMS INC
30 WILSON RD
BUFFALO, NY 14221
Program Manager: JOSEPH FRITZ
Contract #:
Title: MULTISPECTRUM GUIDANCE TARGET GENERATOR (MSGTG)
Topic #: N90-219 Office: NWC ID #: 41177

A MULTISPECTRUM GUIDANCE TARGET GENERATION (MSGTG) SYSTEM IS PROPOSED WHICH WILL PROVIDE DYNAMIC, HIGH FIDELITY STIMULUS TO DUAL MODE SEEKERS. THE MSGTG WILL SUPPORT DEVELOPMENT OF SEEKER SYSTEMS COMPRISED OF AN ACTIVE RF SUBSYSTEM AND A TWO SPECTRUM INFRARED SUBSYSTEM. THE MSGTG WILL PROVIDE MULTISPECTRAL STIMULUS REPRESENT- ING MISSILE ENGAGEMENTS INVOLVING 1-ON-1, OR 1-ON-MANY, WITH COMPLETE FREEDOM OF (SIMULATED) MOTION OF THE IN-THE-LOOP SEEKER. THE MSGTG WILL GENERATE COMPLEX, EXTENDED SOURCE TARGETS AND WILL BE ABLE TO DUPLICATE TEST FLIGHT SCENARIOS TO SUPPORT LABORATORY/ FLIGHT TEST DATA CORRELATION. INFRARED ECM WILL BE MODELED. AN RF ECM CAPABILITY CAN BE ADDED TO THE MSGTG AS REQUIRED. THE MSGTG DESIGN IS BASED ON CURRENT AMHERST SYSTEMS PRODUCT EFFORTS. SEEKER DESIGN ANALYSES AND INFORMATION EXCHANGES WITH THE SPONSOR WILL BE PERFORMED TO TAILOR THE MSGTG DESIGN TO THE SPONSOR'S REQUIREMENTS.

MILLIMETER WAVE TECHNOLOGY INC
1395 S MARIETTA PKWY - BLDG 700
MARIETTA, GA 30067
Program Manager: DENNIS J KOZAKOFF

Contract #:
Title: MULTISPECTRUM GUIDANCE TARGET GENERATORS
Topic #: N90-219 Office: NWC ID #: 41176

THE CURRENT METHODOLOGY OF MULTISPECTRAL HARDWARE-IN-THE-LOOP (HWIL) TARGET SIMULATION IS TO MECHANICALLY POSITION AN IR/RF TARGET HEAD VIA A ROBOT, FOR INSTANCE, LOCATED IN A LARGE ANECHOIC CHAMBER. THE TARGET HED INCLUDES AN IR POINT SOURCE PLUS A THREE (OR FOUR) ELEMENT ANTENNA ARRAY TO SIMULATE TARGET RADAR RETURN, INCLUDING EFFECTS OF GLNT AND DISTRIBUTED TARGETS. THE SEEKER-UNDER-TET (SUT) IS MOUNTED ON 3-AXIS FLIGHT TABLE. THE DEFICIENCIES OF THIS APPROACH INCLUDE: 1) NEED FOR EXPENSIVE ANECHOIC CHAMBER, 2) DYNAMIC/FOV LIMITATION DICTATED BY TARGET POSITIONER (ROBOT), AND 3) DIFFICULTY TO MODEL IR EXTENDED TARGETS. AN APPROACH CONSISTING OF DUAL MODE (IR/RF) TARGET HEAD WHICH CAN BE MOUNTED ON AN OUTER 2-AXIS GIMBAL OF A 5-AXIS FLIGHT TABLE IS RESEARCHED. THIS INCLUDES A STATE-OF-THE-ART VARIABLE APERTURE IR SCENE GENERATOR TO MODEL DISTRIBUTED TARGETS, DIPLEXED WITH A COINCIDENT NEAR FIELD CORRECTED RADAR SCENE. BLOCK DIAGRAMS OF COMPLETE MULTISPECTRAL HWIL SIMULATORS ARE DEVELOPED AND DISCUSSED.

KTECH CORP
901 PENNSYLVANIA NE
ALBUQUERQUE, NM 87110
Program Manager: JAMES J SPATES
Contract #:
Title: MEASUREMENT OF EXPLOSIVE OUTPUTS ELECTRONICALLY
Topic #: N90-221 Office: NWC ID #: 41178

NO METHOD CURRENTLY EXISTS TO DIRECTLY RELATE DEVICE OUTPUT TO THE KNOWN INPUT NECESSARY FOR THE RELIABLE INITIATION OF THE NEXT DEVICE IN AN EXPLOSIVE TRAIN. THE OBJECT OF THIS EFFORT IS TO DEVELOP A TECHNIQUE TO PROVIDE AN ELECTRONIC SYSTEM TO MEASURE THE OUTPUTS OF EXPLOSIVE DEVICES. THE PHASE I EFFORT WILL DEVELOP A TECHNIQUE TO ACCOMPLISH THIS OBJECTIVE. WE PROPOSE TO UTILIZE NEW PIEZO FILM TECHNOLOGY (PVDF) GAUGES TO MAKE THIS MEASUREMENT. ADDITIONALLY, SOME NUMERICAL SIMULATIONS WILL BE PERFORMED TO AID IN EXPERIMENTAL DESIGN AND INTERPRETATION.

MORRO-OSO ELECTRONICS CO
2004 MEZES AVE
BELMONT, CA 94002
Program Manager: WILLIAM F MARSHALL
Contract #:
Title: SAFE-ARM INDICATOR FOR IN-LINE FUZES
Topic #: N90-222 Office: NWC ID #: 41179

PRESENT HIGH-ENERGY, ELECTRONIC, IN-LINE, SAFE-ARMS (S-A'S) LACK THE VISUAL BUILT-IN "SAFE" OR "ARM" INDICATOR COMMONLY FOUND AS A SAFETY FEATURE IN MECHANICAL S-A'S. A MODERN INDICATOR CAN PROVIDE A RELIABLE INDICAION OF THE "SAFE" OR "ARM" CONDITION IN AN ELECTRONIC S-A THUS MAKING THE ELECTRONIC S-A ESSENTIALLY THE SAME AS A MECHANICAL S-A WITH REGARD TO THE VISUAL SAFETY INDICATION. ELECTRONIC SAFE-ARMS STORE FIRING ENERGY IN THE FORM OF A CHARGE IN A HIGH-VOLTAGE ENERGY STORAGE CAPACITOR. WHEN THE ENERGY STORAGE CAPACITOR IS CHARGED UP, THE S-A IS ARMED. THE ENERGY STORAGE CAPACITOR BECOMES DISCHARGED PRODUCING A SAFE CONDITION WHEN ARMING ENERGY IS NOT BEING APPLIED. MOORRO-OSO ELECTRONICS HAS FORMULATED SEVEN VISUAL S-A INDICATOR CONCEPTS AND PROPOSES TO CONDUCT A TRADE-OFF STUDY, SELECT AND FABRICATE TWO OF THE BEST.

SILICON DESIGNS INC
1445-NW MALL ST
ISSAQUAH, WA 98027
Program Manager: JOHN C COLE
Contract #:
Title: AN ELECTRONIC RETARD SENSOR FOR BOMB FUZES
Topic #: N90-223 Office: NWC ID #: 41180

ALTHOUGH CONVENTIONAL MASS-SPRING RETARD SENSORS ARE INEXPENSIVE, THEIR POOR RELIABILITY USUALLY REQUIRES THE USE OF TWO DEVICES IN PARALLEL TO ASSURE SWITCH CLOSURE. THE USE OF TWO DEVICES, HOWEVER, HAS AN ADVERSE AFFECT ON S&A SAFETY. G-SWITCHES USED AS RETARD SENSORS IN THE FMU-139 BOMB FUZE ARE CURRENTLY A MAJOR PROBLEM AREA IN THAT PROGRAM. THEIR POOR RELIABILITY IS DUE PRIMARILY TO IMPERFECTIONS IN THE MACHINED SURFACES, CONTAMINATION, AND TOLERANCE STACK-UP WHICH CAUSE HIGH CONTACT RESISTANCE OR LACK OF OPERATION ALTOGETHER. SILICON DESIGNS HAS DEVELOPED A MINIATURE, LOW-COST ACCELEROMETER THAT COMBINES A CAPACITIVE SENSE ELEMENT AND INTEGRATED SENSE ELECTRONICS IN A SINGLE IC PACKAGE. WE HAVE ALSO DEVELOPED AN ACCELERATION THRESHOLD DETECTION CIRCUIT THAT CAN BE INTEGRATED WITH THE SENSE ELECTRONICS. BECAUSE OUR CURRENT ACCELEROMETER'S HYBRID-BASED CONSTRUCTION AND LASER-TRIM CALIBRATION METHOD IS TOO COSTLY FOR USE IN BOMB FUZES, WE PROPOSE TO REDESIGN THE CALIBRATION CIRCUITS SO ALL CIRCUIT FUNCTIONS CAN BE INTEGRATED ONTO A SINGLE CUSTOM IC ALONG WITH THE SENSE ELEMENT. WE HAVE DESCRIBED A BASE-LINE DESIGN FOR SUCH A CHIP IN THIS PROPOSAL. THE RESULTING ELECTRONIC RETARD SENSOR IC WOULD BE VERY RELIABLE DUE TO ITS FABRICATION USING IC TECHNOLOGY.

APA OPTICS INC
2950 NE 84TH LN
BLAINE, MN 55434
Program Manager: DR M ASIF KHAN
Contract #:
Title: AlGaN ELECTRO-OPTIC WAVEGUIDE BEAM SCANNER
Topic #: N90-224 Office: NWC ID #: 41182

WE PROPOSE A UNIQUE ELECTRO-OPTIC LWIR BEAM SCANNING DEVICE. THIS AlxGa1-xN PLANAR WAVEGUIDE BASED ELECTRO-OPTIC DEVICE CAN BE USED EITHER IN A SCANNER OR A RECEIVER CONFIGURATION. IT HAS THE POTENTIAL OF LARGE FIELD OF VIEW (20 DEGREES), FAST RANDOM ACCESS AND LOW POWER OPERATION. THE DEVICE IS BASED ON A UNIQUE COMBINATION OF ELECTRO-OPTIC BRAGG DIFFRACTION GRATING THAT ARE FABRICATED OVER PLANAR AlxGa1-xN WAVEGUIDES. THESE WAVEGUIDES ARE TO BE FABRICATED OVER SAPPHIRE SUBSTRATES USING ATOMIC LAYER MOCVD DEPOSITIONS IN AN APA PROPRIETARY SYSTEM. TO THE BEST OF OUR KNOWLEDGE OUR DEVICE WILL BE THE FIRST LWIR SOLID STATE SCANNING DEVICE. IT WILL BE SUPERIOR TO ITS CONVENTIONAL OR ACOUSTO-OPTIC COUNTER PARTS OWING TO THE LARGER FIELD OF VIEWS AND HIGHER SPEED. THE PHASE I PROGRAM WILL DEVELOP THE DEVICE DESIGN AND DEMONSTRATE BRAGG GRATING DEFLECTION. THIS FORMS THE BASIS OF OUR DEVICE TECHNICAL APPROACH. PHASE II WILL BE AIMED AT FABRICATING, TESTING AND OPTIMIZING THE DEVICE.

DISPLAYTECH INC
2200 CENTRAL AVE
BOULDER, CO 80301
Program Manager: MICHAEL J O'CALLAGHAN
Contract #:
Title: OPTICAL BEAM STEERING AND SHAPING USING FERROELECTRIC LIQUID CRYSTAL SPATIAL LIGHT MODULATORS

Topic #: N90-224 Office: NWC ID #: 41181

ONE FACTOR LIMITING THE USE OF OPTICS IN APPLICATIONS SUCH AS COMMUNICATIONS, LASER RADAR, AND OPTICAL PROCESSING IS THE LACK OF A SATISFACTORY TECHNOLOGY FOR THE STEERING AND SHAPING OF OPTICAL BEAMS. SIMILAR PROBLEMS HAVE EXISTED FOR RADAR AND RADIO COMMUNICATIONS SYSTEMS. IN THOSE TECHNOLOGIES, HOWEVER, THE PROBLEMS HAVE LARGELY BEEN SOLVED BY THE USE OF PHASED ARRAY ANTENNA TECHNIQUES. DISPLAYTECH HAS DEMONSTRATED A HIGH SPEED ELECTRICALLY ADDRESSED SPATIAL LIGHT MODULATOR (SLM) CONTAINING BOTH A 64x64 ARRAY AND A 1x128 ARRAY WHICH MAY SERVE AS A PROTOTYPE OPLICAL PHASED ARRAY (OPA). THE SLM WAS BUILT BY JOINING FERROELECTRIC LIQUID CRYSTALS (FLCs), A FAST, LOW-VOLTAGE, LOW-POWER ELECTROOPTIC MATERIAL, WITH SILICON INTEGRATED CIRCUITS (ICs). THIS DEVICE HAS A 4.5 kHz FRAME RATE, THEREFORE IT SHOULD BE CAPABLE OF STEERING A BEAM FROM ONE DIRECTION TO ANOTHER IN A TIME OF 220 us. IN THIS PHASE I WORK WE PROPOSE TO EVALUATE THE PERFORMANCE OF THE CURRENT DISPLAYTECH FLC-ICSLM USED AS AN OPA, IDENTIFY AND DEVELOP ALGORITHMS FOR BEAM FORMING AND STEERING, AND DO PRELIMINARY DESIGN OF A MORE ADVANCED FLC-ICSLM OPTIMIZED FOR BEAM FORMING AND STEERING. THE AIM OF THE PHASE I WORK WILL BE TO PROVIDE A BASIS FOR THE FABRICATION OF MORE ADVANCED DEVICES IN PHASE II.

BELTRAN INC
1133 E 35TH ST
BROOKLYN, NY 11210
Program Manager: THOMAS C KOSVIC
Contract #:
Title: SOLID FAE DETONATION MODEL
Topic #: N90-225 Office: NWC ID #: 41183

BELTRAN, INC. WILL UTILIZE THE MECHANISTIC MODEL OF DUST DETONATIONS DEVELOPED AT THE UNIVERSITY OF MICHIGAN, IN CONJUNCTION WITH BELTRAN'S CHEMICAL EQUILIBRIUM (NASA-CET) PROGRAM AND COMPLETE JANNAF THERMOCHEMICAL AND TRANSPORT PROPERTY DATA TAPE, THUS, YIELDING A PROGRAM CAPABLE OF MODELING SOLID FUEL (DUST) DETONATIONS FOR A WIDE VARIETY OF FUELS. THE NEW PROGRAM WILL ENABLE THE EFFECT ATTRIBUTED TO TEMPERATURE, PARTICLE SIZES, PARTICLE SHAPES, PARTICLE LOADING, COATINGS AND RADIATION FACTORS TO BE DETERMINED. THIS WILL ENABLE SELECTION OF CANDIDATE MATERIALS FOR FURTHER EVALUATION IN THE PHASE II EFFORT.

SYSTEMS SUPPORT INC
10024 COLVIN RUN RD
GREAT FALLS, VA 22066
Program Manager: CARL BOYARS
Contract #:
Title: COMPACTION AND RAPID DISPERSION OF SOLID FUELS FOR FUEL-AIR EXPLOSIVES
Topic #: N90-226 Office: NWC ID #: 41184

CURRENT FUEL-AIR EXPLOSIVE WARHEATS USE A LIQUID FUEL. LIQUIDS CHARACTERISTICALLY INTRODUCE HANDLING AND STORAGE HAZARDS AND HAVE A LOW ENERGY DENSITY. USE OF PRACTICAL SOLID FUELS COULD OVERCOME THOSE DEFICIENCIES. SOLID FUELS ARE PROPOSED THAT COULD MEET THE REQUIREMENTS OF DISPERSION IN UNDER 20 MILLISEC AND FINAL PARTICLE SIZE UNDER 10 MICRONS BY DISPERSION AS VAPORIZED FUELS AND MOLTEN METAL DROPLETS. SPECIFIC SOLID FUEL COMPOSITION PROPOSED ARE CONSIDERED PROPRIETARY INFORMATION AND ARE IDENTIFIED IN THE BODY OF THIS PROPOSAL.

BLAZE-TECH CORP

145 HIGHLAND AVE
WINCHESTER, MA 01890
Program Manager: DR N ALBERT MOUSSA
Contract #:
Title: REPLICATION OF AIRCRAFT STRUCTURE FOR BALLISTIC VULNERABILITY TESTING
Topic #: N90-227 Office: NWC ID #: 41185

FOR MANY YEARS, THE SURVIVABILITY/VULNERABILITY COMMUNITY HAS BEEN CONCERNED WITH THE ADVERSE IMPACT OF BALLISTICALLY-INDUCED HYDRAULIC RAM ON THE STRUCTURAL RESPONSE OF AIRCRAFT FUEL TANKS. THE NAVY WISHES TO DEVELOP COST-EFFECTIVENESS TEST APPROACHES, FIXTURE DESIGNS OR PANEL DESIGNS TO OBTAIN COMPARABLE BALLISTIC BEHAVIOR BETWEEN PANEL SAMPLES AND ACTUAL AIRCRAFT STRUCTURES. THIS PROPOSAL PRESENTS AN APPROACH TO CARRYING OUT SUCH DEVELOPMENTS.

ABACUS PROGRAMMING CORP
14545 VICTORY BLVD
VAN NUYS, CA 91411
Program Manager: JAMES GEISSMAN
Contract #:
Title: INERTIAL SYSTEM EXPERT SYSTEM
Topic #: N90-228 Office: NWC ID #: 41186

ABACUS PROGRAMMING CORPORATION PROPOSES TO KNOWLEDGE ENGINEER AND DEVELOP A PROTOTYPE OF AN INTERACTIVE EXPERT SYSTEM TO AID IN THE SELECTION OF INERTIAL SYSTEMS FOR NEW AND UPGRADED MISSILE/WEAPON SYSTEMS. THE EXPERT SYSTEM WILL ALLOW A NON-SPECIALIST USER TO ACT AS AN EXPERT IN INERTIAL SYSTEMS TO MATCH MISSION REQUIREMENTS WITH INERTIAL HARDWARE CAPABILITIES AND TO EVALUATE THE MISSION IMPLICATIONS OF SELECTED SYSTEMS. THE EXPERT SYSTEM FOR NAVAL WEAPONS CENTER, CHINA LAKE, WILL HAVE "TUTORIAL OR HELP UTILITIES WHICH WILL GUIDE ANY SCIENTIST, ENGINEER, OR TECHNICAL MANAGER THROUGH A SESSION." "FOR PHASE I...THE DATABASE OR THE RULES SET MUST BE SIMPLE TO MODIFY IN ORDER TO KEEP IT UP-TO-DATE AND ALLOW FOR GROWTH." ABACUS, A RECOGNIZED LEADER IN THE APPLICATION OF EXPERT SYSTEM TECHNOLOGY AND WITH A CORPORATE EXPERTISE IN THE INERTIAL SYSTEMS KNOWLEDGE DOMAIN, PROPOSES TO DEVELOP THIS PROTOTYPE EXPERT SYSTEM WITH THE CAPABILITY TO GENERATE FACT SHEETS IN A STANDARD NWC ENTRY/DISPLAY/HARD COPY FORMAT. THE STANDARD FORMAT WILL SIMPLIFY THE INTERFACE WITH VENDORS AND SPECIALISTS AND ENABLE RAPID UPDATING OF INERTIAL SYSTEMS FACTS IN THE NWC EXPERT SYSTEM WHICH ARE ESSENTIAL FOR THE PRACTICAL UTILITY OF THIS EXPERT SYSTEM APPLICATION.

INNOVATIVE RESEARCH INC
7846 N ITHACA LN
MAPLE GROVE, MN 55369
Program Manager: DR KAILASH C KARKI
Contract #:
Title: PREDICTION OF THE HEAT TRANSFER COEFFICIENTS ON SOLID SURFACES EXPOSED TO A ROCKET EXHAUST PLUME
Topic #: N90-229 Office: NWC ID #: 41187

IN THE PATH OF A ROCKET MOTOR EXHAUST, VARIOUS SOLID SURFACES SUCH AS THE ROCKET NOZZLE, JET VANES, AND TURBINE BLADES ARE SUBJECTED TO VERY HIGH TEMPERATURES AND LARGE HEAT FLUXES. OFTEN SERIOUS EROSION OF THESE SURFACES OCCURS WITHIN A FEW SECONDS. THE FLOW IN THE EXHAUST PLUME IS NOT ONLY SUPERSONIC AND VERY HOT BUT USUALLY CONTAINS ALUMINUM PARTICLES, WHICH CHANGE THE PROPERTIES OF THE PLUME GAS AND CAUSE INTENSE THERMAL RADIATION. METHODS ARE REQUIRED FOR A RELIABLE PREDICTION OF THE HEAT TRANSFER COEFFICIENT

ON SURFACES EXPOSED TO THE ROCKET EXHAUST. THE OBJECTIVE OF THE PRESENT PROPOSAL IS TO DEVELOP A COMPUTATIONAL METHOD FOR OBTAINING THE LOCAL AND OVERALL HEAT TRANSFER COEFFICIENTS ON THE SOLID SURFACES IN THE EXHAUST PLUME. THE PROJECT TEAM AT INNOVATIVE RESEARCH, INC. WILL USE ITS GENERAL EXPERTISE IN THE AREA OF COMPUTATION OF FLUID FLOW, HEAT TRANSFER, AND THERMAL RADIATION. IN PHASE I, WE SHALL DEMONSTRATE THE APPROACH ON A TWO-DIMENSIONAL SITUATION. PHASE II WILL BE DEVOTED TO THE MORE COMPLETE, THREE-DIMENSIONAL MODEL AND AN EXTENSIVE STUDY OF THE PROBLEM.

VATELL CORP
PO BOX 66
CHRISTIANSBURG, VA 24073
Program Manager: JONATHAN M HAGER
Contract #:
Title: ROCKET PLUME HEAT TRANSFER PROBES
Topic #: N90-229 Office: NWC ID #: 41188

VATELL CORPORATION PROPOSES TO FABRICATE HEAT FLUX MICROSENSOR PROBES SIMILAR TO THOSE BEING DEVELOPED IN A CURRENT AIR FORCE SBIR PROGRAM AND APPLY OUTER PROTECTIVE LAYERS TO THE SENSORS TO ENHANCE THEIR ABRASION RESISTANCE AND HIGH TEMPERATURE RATINGS. THE CURRENT PROBES ARE DESIGNED FOR APPLICATION AT 1000 DEGREES CENTIGRADE. THE MODIFIED PROBES WILL BE DESIGNED TO BE USED IN THE PLUME OF A ROCKET MOTOR FOR A DURATION OF 3 TO 10 SECONDS. THE NOMINAL FLOW FIELD CONDITIONS ARE; MACH 3.4, GAMMA 1.2 AND STAGNATION TEMPERATURE 5800 DEGREES FAHRENHEIT. THREE PROBES WITH DIFFERENT OUTER PROTECTIVE LAYERS WILL BE CONSTRUCTED, CALIBRATED, TESTED FOR THERMAL SHOCK RESISTANCE, THEN DELIVERED TO THE SPONSOR. IN A PHASE II CONTINUATION, DIRECT APPLICATION OF HEAT FLUX MICROSENSORS TO THRUST VECTOR JET VANES, TURBINE BLADES AND OTHER ROCKET COMPONENTS WILL BE EXPLORED.

AMERICAN RESEARCH CORP OF VA
PO BOX 3406
RADFORD, VA 24143
Program Manager: DR R J CHURCHILL
Contract #:
Title: LASER BRAZING PROCESS DEVELOPMENT FOR CERAMIC-TO-METAL JOINING OF RADOME COMPONENTS
Topic #: N90-230 Office: NWC ID #: 41189

THERE IS A NEED FOR UNIQUE JOING/BONDING PROCESSES THAT CAN DIRECTLY JOIN CERAMIC IR AND RF DOME COMPONENTS TO CYLINDRICAL METAL SURFACES. EXPOSURE TO THE HIGH TEMPERATURES ASSOCIATED WITH CONVENTIONAL BRAZING PROCESSES CAN DEGRADE THE OPTICAL PROPERTIES OF MATERIALS AND PROMOTE CHEMICAL REACTION BETWEEN THE BRAZE MATERIAL AND THE CERAMIC THROUGHOUT THE ENTIRE HEAT AFFECTED ZONE (HAZ). THEREFORE, IT IS DESIRABLE TO UTILIZE A HIGHLY LOCALIZED HEAT SOURCE FOR THE JOINING EFFORT. THIS PROPOSAL SUGGESTS LASER BRAZING AS A MEANS OF PROVIDING THE HEAT NECESSARY TO FORM A METALLURGICAL BOND WHILE LIMITING THE THERMAL DEGRADATION TO REGIONS ADJACENT TO THE JOINT. INNOVATIVE GLASS CERAMIC MATERIALS HAVING MATCHED COEFFICIENTS OF THERMAL EXPANSION WILL BE USED AS BRAZE FILLER. THE PHASE I TECHNICAL OBJECTIVE INCLUDE EVALUATION OF CANDIDATE BRAZING MATERIALS, DESIGN OF A LASER PROCESSING CHAMBER, SELECTION OF LASER PROCESSING PARAMETERS, ACQUISITION OF FAMILIES OF TEST DATA AND OPTIMIZATION OF A PROOF-OF-CONCEPT SYSTEM FOR ENGINEERING DEVELOPMENT IN PHASE II OF THE PROGRAM. SUCCESSFUL COMPLETION OF THE PROGRAM OBJECTIVES WOULD RESULT IN A TECHNIQUE FOR PRODUCING HERMETICALLY SEALED CERAMIC-TO-METAL JOINTS HAVING GOOD THERMAL- MECHANICAL PROPERTIES AND MINIMAL HAZ.

ATSS INC
PO BOX 5487
SAN BERNARDINO, CA 92412
Program Manager: DAVID G PAQUETTE
Contract #:
Title: LASER BRAZING CERAMICS TO METALS
Topic #: N90-230 Office: NWC ID #: 41190

A METHODOLOGY FOR JOINING RF OR IR DOME MATERIALS TO METALS BY LASER BRAZING WILL BE DEVELOPED AND DEMONSTRATED. THE APPROACH USED WILL AVOID THERMAL STRESS CRACKING OF THE CERAMIC DURING BRAZING BY MINIMIZING THE MASS OF MATERIAL THAT MUST BE HEATED TO BRAZING TEMPERATURE. BRAZING EXPERIMENT VARIABLES WILL INCLUDE SYSTEMATIC MODIFICATION OF THE METAL CONFIGURATION AS WELL AS THE LASER POWER AND HEATING TIME. FINITE ELEMENT THERMOSTRUCTURAL ANALYSIS TECHNIQUES WILL BE USED TO ASSIST IN SELECTION OF EXPERIMENTAL VARIABLES.

SCS TELECOM INC
107 HAVEN AVE
PORT WASHINGTON, NY 11050
Program Manager: MARVIN KULLBACK
Contract #:
Title: MINIMIZING THE EFFECT OF JAMMING THROUGH THE USE OF WIDEBAND HF
Topic #: N90-231 Office: NADC ID #: 40994

HF IS USED EXTENSIVELY TO SUPPORT BEYOND-LINE-OF-SIGHT (BLOS) COMMUNICATION REQUIREMENTS. IN GENERAL THESE LINKS ARE BOTH EASY TO EXPLOIT AND EASY TO JAM. FREQUENCY HOPPING TECHNIQUES HAVE BEEN USED WITH LIMITED SUCCESS AGAINST THIS JAMMING. FURTHER, THE DATA TO BE TRANSMITTED IS CONSTRAINED TO HAVE LOW BIT RATES. THIS PROPOSAL DESCRIBES A NOVEL APPROACH TO IMPROVE JAM RESISTANCE AND TO ASSURE LPI AND LPE. THE TECHNIQUES USED INCLUDE SHARPLY FILTERED TRELLIS CODED FM TO PROVIDE LPI AND LPE; DIRECT SEQUENCY SPREAD SPECTRUM OF THE HF SIGNAL TO ACHIEVE A WIDE BANDWIDTH AND REDUCE FADING; AND NARROWBAND EXCISION USING THE FFT TO MINIMIZE THE EFFECT OF JAMMERS.

EDGEWOOD TELE-SERVICES INC
135 TENNYSON DR
PLAINSBORO, NJ 08536
Program Manager: WALTER LEVY
Contract #:
Title: MULTI-TADIL CONTROL ALGORITHMS
Topic #: N90-232 Office: NADC ID #: 40995

THE OBJECTIVES OF THIS STUDY ARE TO DEVELOP TECHNICAL ALGORITHMS FOR THE ALLOCATION OF MULTIPLE TACTICAL COMMUNICATIONS SYSTEM RESOURCES IN A NAVAL BATTLEGROUP ENVIRONMENT TO ACHIEVE A HIGH LEVEL OF EFFICIENCY AND EFFECTIVENESS. THESE ALGORITHMS WILL ADDRESS A FUTURE NAVAL TACTICAL COMMUNICATIONS ENVIRONMENT IN WHICH MULTIPLE SYSTEMS ARE SIMULTANEOUSLY OPERATIONAL AND PROCESSING POWER MAY BE USED TO EFFECT SOPHISTICATED CONTROL MECHANISMS. THE PHASE I EFFORT HAS AS ITS OBJECTIVES THE DEVELOPMENT OF SYSTEM CONCEPTS, MEASURES OF EFFICIENCY, AND SPECIFICATION OF THE ALGORITHMS. PERFORMANCE OF THE ALGORITHMS WILL ALSO BE EXAMINED ON A PRELIMINARY BASIS IN PHASE I. PHASE I WILL LAY A FOUNDATION FOR PHASE II WHICH WOULD ENCOMPASS FURTHER DETAILED STUDY OF ALGORITHMS INCLUDING PERFORMANCE EVALUATION USING A FULL SCALE BATTLEGROUP WIDE SIMULATION.

ABRAMS Z INC
1112 CLARK RD
PHILADELPHIA, PA 19118
Program Manager: BURTON S ABRAMS
Contract #:
Title: A NEW TECHNIQUE TO ENHANCE SPREAD SPECTRUM COMMUNICATIONS
Topic #: N90-233 Office: NADC ID #: 40996

A NEW AND INNOVATIVE TECHNIQUE IS PROPOSED FOR USE IN THE RECEPTION OF SPREAD SPECTRUM CODE DIVISION MULTIPLE ACCESS (CDMA) SIGNALS. THE TECHNIQUE ALLOWS MUCH GREATER SEPARABILITY OF THE SIGNALS THAN THE CONVENTIONAL DEMODULATION APPROACH, THEREBY OVERCOMING THE USUAL NEAR-FAR INTERFERENCE PROBLEM ASSOCIATED WITH CDMA SYSTEMS. THE PROPOSAL IS FOCUSED ON A SONOBUOY TRANSMISSION SCENARIO IN WHICH THE AMOUNT OF BANDWIDTH EXPANSION IS LIMITED TO 1:100 (20 dB), AND WHERE DEMODULATION OF EACH WEAK CDMA SIGNAL REQUIRES MORE THAN 20 dB REJECTION OF STRONG COCHANNEL SIGNALS. REQUIRING ONLY A SINGLE RECEIVE ANTENNA, THE NEW TECHNIQUE INCLUDES THE AJ CAPABILITY TO REJECT OTHER COCHANNEL INTERFERENCES HAVING A VARIETY OF WAVEFORM TYPES. THE TECHNIQUE CAN BE READILY IMPLEMENTED WITH AVAILABLE DIGITAL COMPONENTS. A COMPUTER SIMULATION IS PROPOSED TO DEMONSTRATE THE FEASIBILITY AND PERFORMANCE OF THIS TECHNIQUE.

AJ SYSTEMS
1131 SEENA AVE
LOS ALTOS, CA 94024
Program Manager: A J VAN DIERENDONCK
Contract #:
Title: GPS SYSTEM SPECIFICATION FOR SHIPBOARD TACAN REPLACEMENT
Topic #: N90-235 Office: NADC ID #: 40997

THE TACTICAL AIR NAVIGATION (TACAN) SYSTEM IS SCHEDULED TO BE PHASED-OUT IN THE FUTURE. THIS MEANS THAT, AS A SYSTEM, IT MUST BE REPLACED WITH ANOTHER NAVIGATION SYSTEM. THE NAVSTAR GLOBAL POSITIONING SYSTEM (GPS) HAS BEEN DESIGNATED AS ITS REPLACEMENT. HOWEVER, HOW GPS WILL DO THAT HAS NOT BEEN SPECIFIED, ESPECIALLY WHEN IT COMES TO SHIPBOARD APPLICATIONS. IT IS THE PURPOSE OF THIS SBIR PROGRAM TO DEVELOP A GPS SYSTEM SPECIFICATION FOR A SHIPBOARD TACAN REPLACEMENT TO ENSURE THAT GPS CAN BE PROPERLY IMPLEMENTED AS THE EVENTUAL REPLACEMENT. IN ORDER TO MAKE GPS AN ADEQUATE REPLACEMENT FOR TACAN, IT MUST BE USED IN A DIFFERENTIAL MODE IN CONJUNCTION WITH A DATA LINK, WHICH MAY BE A CONVENTIONAL COMMUNICATION SYSTEM, OR ONE THAT IS IMPLEMENTED AT ONE OR TWO OF THE GPS FREQUENCIES. IN THE LATER CASE, THE DATA LINK BECOMES A PSEUDOLITE SYSTEM. IN THE DIFFERENTIAL MODE, BOTH THE TRANSMITTING SYSTEM ON THE SHIP AND THE USER EQUIPMENT IN THE AIRCRAFT NAVIGATE USING THE SAME GPS SPACE VEHICLES. WHETHER OR NOT A CONVENTIONAL DATA LINK OR A PSEUDOLITE SYSTEM IS USED, THE SHIP LOCATIONS (AND VELOCITIES) ARE BROADCAST TO THE USER EQUIPMENT, PROVIDING THAT KNOWLEDGE AND MAKING IT POSSIBLE FOR THE USER EQUIPMENT TO NAVIGATE WITH RESPECT TO THE SHIP.

METCUT RESEARCH ASSOCS INC
11240 CORNELL PARK DR
CINCINNATI, OH 45242
Program Manager: JOHN D SCHRISTOPHER
Contract #:
Title: MACHINABILITY OF AF1410 HIGH STRENGTH STEEL
Topic #: N90-236 Office: NADC ID #: 40998

THE ULTRA-HIGH-STRENGTH STEEL, AF1410, HAS DESIRABLE MECHANICAL PROPERTIES FOR NAVAL AIRCRAFT APPLICATIONS. HOWEVER, THE ABSENCE OF ACCURATE MACHINING INFORMATION ON THE VARIOUS OPERATIONS NECESSARY TO PRODUCE PARTS HAS LIMITED THE USE OF THIS ALLOY. SIGNIFICANT POTENTIAL IMPROVEMENTS OF IN-SERIVE LIFE OF AIRCRAFT COMPONENTS ARE NOT BEING REALIZED, ALONG WITH THE RESULTING COST SAVINGS, BECAUSE OF THE INABILITY TO FORECASE MACHINE COSTS AND PRODUCTIVITY LEVELS. COMPREHENSIVE, ACCURATE MACHINING DATA, WHEN ACCOMPANIED BY A SIMPLE EASY-TO-USE COST ANALYSIS, ENABLES THE POTENTIAL CONTRACTOR TO COMPETITIVELY BID ON MANUFACTURING AIRCRAFT COMPONENTS, BASED ON HIS INDIVIDUAL EQUIPMENT, SCHEDULING, AND PERSONNEL LIMITATIONS. CURRENT EFFICIENT TECHNIQUES AVAILABLE FOR MACHINABILITY AND GRINDABILITY STUDIES PERMIT THE ACQUISITION OF THE MAXIMUM USABLE INFORMATION WITH A MINIMUM INVESTMENT OF TESTING TIME, USUALLY PRODUCING STATISTICALLY VALIDATED TEST RESULTS. THE COMBINED RELATIONSHIP OF CUTTING SPEED AND FEED ON TOOL LIFE OR GRINDING WHEEL WEAR CAN OFTEN BE EXPRESSED AS AN EQUATION WHICH CAN SUPPORT A VARIETY OF COMPUTER BASED PLANNING AND SCHEDULING AS WELL AS OTHER CIM SYSTEMS. METCUT RESEARCH HAS BEEN PRODUCING MACHINING AND GRINDING INFORMATION FOR VARIOUS U.S. GOVERNMENT AGENCIES AND PRIVATE INDUSTRY SINCE 1948.

ESSEX CORP
1040 WOODCOCK RD - STE 227
ORLANDO, FL 32803
Program Manager: DR ROBERT S KENNEDY
Contract #:
Title: DEVELOPMENT OF A NON-INTRUSIVE COGNITIVE WORKLOAD MEASUREMENT DEVICE
Topic #: N90-237 Office: NDC ID #: 40999

THE ACCELERATING TEMPO OF MILITARY OPERATIONS INCREASES THE TASK DEMANDS AND WORK RELATED STRESSES IMPOSED ON HUMAN OPERATORS. AS NEW TECHNOLOGICAL DESIGNS ARE INCORPORATED INTO MILITARY SYSTEMS, A METRIC IS REQUIRED TO ENSURE THAT HUMAN COGNITIVE WORKLOAD LIMITS ARE NOT EXCEEDED. SOME PROGRESS IN THIS ENDEAVOR HAS BEEN ACHIEVED IN USING AS OBJECTIVE WORKLOAD INDICATORS A VARIETY OF ELECTRO- PHYSIOLOGICAL TECHNIQUES, INCLUDING EEG AND NEURAL EVOKED POTENTIALS. HOWEVER, THESE OBJECTIVE TECHNIQUES TEND TO BE INTRUSIVE, RELATIVELY ARTIFICIAL, AND NON-PORTABLE. WE BELIEVE THERE ARE MORE READILY OBTAINABLE MEASURES THAT CAN SERVE AS IMPLE EXTERNAL INDICANTS OF WORKLOAD, AND WHICH CAN BE BUNDLED IN PORTABLE, VEST-POCKET SYSTEMS TO BE EMPLOYED IN APPLIED WORKLOAD ASSESSMENT. WE HAVE HAD SUCCESS IN LABORATORY RESEARCH RELATING EYE MOVEMENT CHARACTERISTICS (VELOCITY, ACCELERATION, ETC.) TO A TASK SCALED IN COGNITIVE WORKLOAD. IN PHASE I, WE PROPOSE TO DERIVE A TRANSFER FUNCTION BETWEEN THESE EYE MOVEMENT INDICANTS AND TASK DEMANDS BY USING A SET OF TASKS WHICH ARE INDEXED FOR LEVEL OF COGNITIVE WORKLOAD. FROM THESE RELATIONS, A PROTOTYPE OF A TRANSPORTABLE DEVICE IN WHICH EYE MOVEMENT DATA ARE COLLECTED AND AUTOMATICALLY SCORED WILL BE DEVELOPED FOR FIELD USAGE.

STRESS PHOTONICS INC
1504 EDGEHILL DR
MADISON, WI 53706
Program Manager: DR NEAL F ENKE
Contract #:
Title: THERMOGRAPHIC NON-DESTRUCTIVE EVALUATION
Topic #: N90-238 Office: NADC ID #: 41000

THE PROPOSAL IS TO ESTABLISH QUANTITATIVE THERMOGRAPHIC NON-DESTRUCTIVE EVALUATION (QTNDE) FOR NONDESTRUCTIVE INSPECTION AND DEFECT EVALUATION OF FRACTURE-CRITICAL ADVANCED AIRCRAFT MATERIALS. THIS WILL BE BASED ON RECENT THEORETICAL AND EXPERIMENTAL

ADVANCES CONCERNING THE ADIABATIC THERMOELASTIC EFFECT AND ADDITIONAL EXPERIMENTS ON TWO DEMONSTRATION MATERIALS. A SCREENING MATRIX WILL BE ESTABLISHED TO RATE QTNDE FOR SUITABILITY TO INVESTIGATE PARTICULAR MATERIALS AND COMPONENTS. THE SCHEME WILL ALLOW REALISTIC CONSIDERATION OF ARBITRARY MATERIALS (ISOTROPIC OR ANISOTROPIC), GEOMETRIES (NOTCHES; FLAWS; COMPLES TOPOLOGIES), AND SERVICE CONDITIONS (WITHOUT UPPER LIMIT IN TEMPERATURE). THE BEST SPECIAL TECHNIQUE OF QTNDE WILL BE USED FOR EACH MATERIAL TO ASSESS THE CRITICALITY OF FLAWS IN TERMS OF DAMAGE EVOLUTION RATES AND LIFE: a) EVOLUTION OF RANDOM STRESS RAISERS, b) MODULUS CHANGE, OR, c) DENSITY CHANGE. THE FULL-FIELD THERMOGRAPHIC DATA ARE ALWAYS COLLECTED AT NONDESTRUCTIVE LEVELS OF CYCLIC LOADS.

CFD RESEARCH CORP
3325-D TRIANA BLVD
HUNTSVILLE, AL 35805
Program Manager: DR ANDRZEJI J PRZEKWAS
Contract #:
Title: DRAG REDUCTION ON AN EJECTION SEAT DURING HIGH SPEED EJECTION
Topic #: N90-239 Office: NADC ID #: 41001

THE PERFORMANCE CAPABILITY OF EMERGENCY ESCAPE SEATS IS LIMITED AT HIGH AIRPLANE SPEEDS AND LOW ALTITUDES BY THE OCCURRENCE OF WINDBLAST INJURIES. CURRENT STATE-OF-THE-ART SEATS, AT SPEEDS OF 600 KEAS EXPOSE THE OCCUPANT TO FORCES BEYOND PHYSICALLY TOLERABLE LIMITS, DUE TO LARGE DRAG FORCES ACTING ON THE ESCAPE SYSTEM. FUTURE AIRCRAFT MISSIONS WOULD REQUIRE OPEN SEAT EJECTION AT UP TO 725 KEAS. THEREFORE, NEW WINDBLAST PROTECTION AND STABILIZATION CONCEPTS WILL BE IDENTIFIED AND ANALYZED. IN THIS PROJECT, AN ADVANCED CFD CODE WILL BE DEVELOPED AND VALIDATED FOR STATIC AND DYNAMIC ANALYSIS OF EJECTION SEATS. IN PHASE I, AN EXISTING CFD CODE (REFLEQS-3D, WHICH ALREADY HAS WELL-TESTED BODY FITTED COORDINATES CAPABILITY) WILL BE MODIFIED TO ACCOUNT FOR ALL GEOMETRIC DETAILS OF THE SEAT, OCCUPANT, EQUIPMENT, AND PROTECTION/STABILIZATION DEVICES. A THOROUGH AERODYNAMIC ANALYSIS WILL BE PERFORMED FOR A SELECTED EJECTION SEAT, TO DEMONSTRATE THE FEASIBILITY OF THE APPROACH. IN PHASE II, THE CODE WILL BE FURTHER IMPROVED, VALIDATED, AND APPLIED TO EVALUATE SELECTED NOVEL CONCEPTS OF WINDBLAST PROTECTION, DRAG REDUCTION, AND STABILIZATION. THE CODE WILL BE WELL DOCUMENTED AND SUPPLIED TO NADC.

NIELSEN ENGINEERING & RESEARCH INC
510 CLYDE AVE
MOUNTAIN VIEW, CA 94043
Program Manager: MICHAEL R MENDENHALL
Contract #:
Title: DRAG REDUCTION ON AN EJECTION SEAT DURING HIGH SPEED EJECTION
Topic #: N90-239 Office: NADC ID #: 41002

A PROGRAM OF WORK LEADING TO AN ANALYTICAL COMPUTATIONAL FLUID DYNAMICS (CFD) CAPABILITY TO PREDICT THE DETAILED FLUID MECHANICS OF AN EJECTION SEAT DURING HIGH SPEED EJECTION IS DESCRIBED. THE METHOD WILL CONSIDER TRANSONIC FLOWS AT HIGH DYNAMIC PRESSURES INCLUDING EFFECTS OF SHOCK WAVES AND POSSIBLE TRANSIENTS IN THE STAGNATION ZONE. THE PROPOSED ANALYSIS PROCEDURE, USING EXISTING TECHNOLOGY, WILL INVOLVE SOLUTIONS OF THE NAVIER-STOKES EQUATIONS FOR UNSTRUCTURED MESHES SURROUNDING THE COMPLEX CONFIGURATIONS CORRESPONDING TO MODERN EJECTION SEATS WITH AN OCCUPANT. THE PHASE I STUDY WILL DEMONSTRATE THE FEASIBILITY OF USING ADVANCED COMPUTATIONAL TECHNIQUES TO PREDICT THE AERODYNAMIC FORCES AND MOMENTS ON THE SEAT DURING HIGH SPEED EJECTION, AND PREDICTED DETAILS OF THE ASSOCIATED FLOW FIELD WILL GIVE INSIGHT INTO DESIGN IMPROVEMENTS SUCH AS DRAG REDUCTION AND REDUCED WINDBLAST LOADS.

ADVANCED STRUCTURES TECHNOLOGY INC
2851 S 44TH ST - UNIT #4
PHOENIX, AZ 85040
Program Manager: ALAN D LANE
Contract #:
Title: PRETENSIONING DEVICE DESIGN FOR CRASH PROTECTION
Topic #: N90-240 Office: NADC ID #: 41003

THE CURRENT FIVE-POINT MILITARY AVIATION RESTRAINT SYSTEM (FOR NON-EJECTION CREW SEATS) WHEN PROPERLY USED (I.E., TIGHTLY ADJUSTED), CAN PROVIDE GOOD OCCUPANT CRASH PROTECTION. THE RESTRAINT SYSTEMS ALSO INCLUDE AN INERTIAL REEL ON THE SEAT BACK WHICH IS DESIGNED TO LOCK THE SHOULD STRAPS AT THE ONSET OF A CRASH, IN THE SAME MANNER THAT THE COMMON AUTOMOBILE SEAT BELT INERTIAL REEL LOCKS WHEN JERKED QUICKLY. BY LOCKING THE INERTIAL REEL, THE CREWMEMBER'S FORWARD MOTION IS LIMITED TO THE AMOUNT OF STRETCH IN THE BELTS, THEREBY GREATLY REDUCING THE RISK OF SERIOUS INJURY (OR DEATH) DUE TO HEAD (OR UPPER TORSO) IMPACT WITH THE INSTRUMENT PANEL OR CONTROL STICK. HOWEVER, MILITARY HELICOPTER CREWMEMBER'S TYPICALLY WILL LOOSEN THE RESTRAINT SHOULDER STRAPS IN ORDER TO GAIN INCREASED COMFORT AND MOBILITY (RANGE OF MOTIONS). SINCE THE CREWMEMBERS ARE UNABLE TO TIGHTEN THE RESTRAINT SYSTEM IN AN IMPENDING CRASH SITUATION, THE RESTRAINT SYSTEM'S ABILITY TO ADEQUATELY PROTECT THEM DURING THE CRASH EVENT IS DEGRADED. THIS PROPOSAL DESCRIBES AST'S TECHNICAL APPROACH TO SOLVING THIS PROBLEM, OUR UNIQUE CAPABILITIES TO ACCOMPLISH THE PROJECT, PERSONNEL QUALIFICATIONS, AND RELATED EXPERIENCE.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
Program Manager: TED E KIRCHNER
Contract #:
Title: PBO/ALFS CABLE
Topic #: N90-242 Office: NADC ID #: 41004

AIRBORN LOW FREQUENCY SONAR (ALFS) CABLES MADE WITH CURRENT STATE-OF-THE-ART MATERIALS MAKE PRECISE DEPTH CONTROL DIFFICULT AND THREATEN HELICOPTER SAFETY DURING RETRIEVAL. STRETCH CAN BE LIMITED BY REDUCING STRESS (LARGER DIAMETER) BUT THIS ADDS UNACCEPTABLE WEIGHT AND HANDLING CHARACTERISTICS, PARTICULARLY AT COLD TEMPERATURES. A NEW CABLE DESIGNED FOR MINIMUM STRETCH AND USING A NEW ULTRAHIGH MODULUS/HIGH STRENGTH LIQUID CRYSTAL ORDERED POLYMER WILL REDUCE CABLE DIAMETER (AND WEIGHT) TO A NEW MINIMUM AND ELIMINATE CURRENT ELASTICITY AND HANDLING PROBLEMS. WE BELIEVE THIS NEW CABLE WILL BE 30 PERCENT SMALLER IN DIAMETER AND 50 PERCENT LIGHTER THAN THE CURRENT 8.4 mm DIAMETER KEVLAR CABLE. THE PROPOSED PHASE I PROGRAM WILL DESIGN A MINIMUM STRETCH/MINIMUM WEIGHT CABLE CONSISTENT WITH NAVY PERFORMANCE REQUREMENTS USING POLY-P-PHENYLENE BENZOBISOXAZOLE (PBO) FIBER. A SAMPLE CABLE WILL BE FABRICATED BY NEW ENGLAND ROPES, TESTED AND EVALUATED BY FOSTER-MILLER FOR PERFORMANCE AND TO RECOMMEND PHASE II IMPROVEMENTS. THE SUCCESSFUL TEST PROGRAM WILL FORM THE BASIS OF A PHASE II PROGRAM THAT WILL OPTIMIZE THE CABLE DESIGN AND FABRICATE AND TEST A FULL-SCALE PROTOTYPE ALFS CABLE THAT WILL BE DELIVERED TO NADC.

MASSA PRODUCTS CORP
280 LINCOLN ST
HINGHAM, MA 02043
Program Manager: STEPHEN C BUTLER

Contract #:
Title: DIRECTIONAL FLEXTENSIONAL TRANSDUCER
Topic #: N90-244 Office: NUSC ID #: 41192

A LOW-FREQUENCY UNDERWATER SOUND CLASS IV FLEXTENSIONAL TRANSDUCER CAPABLE OF OPERATING IN BOTH THE OMNIDIRECTIONAL AND UNIDIRECTIONAL MODES WILL BE STUDIED AND EVALUATED UNDER PHASE I. OUR APPROACH IS BASED ON THE INVENTION DESCRIBED IN U.S. PATENT 4,754,441 (JOHN L. BUTLER, "DIRECTIONAL FLEXTENSIONAL TRANSDUCER", JUNE 28, 1988). THE DIRECTIONALITY IS ACHIEVED BY EXCITING THE DRIVE STACK INTO BOTH EXTENSIONAL AND INEXTENSIONAL MODES CAUSING THE SHELL TO EXECUTE BOTH EVEN AND ODD MODES, RESULTING IN ADDITIVE MOTION ON ONE SIDE AND CANCELLED MOTION ON THE SECOND SIDE. A SCALE MODEL WILL BE CONSTRUCTED AND ANALYZED.

ARGOTEC INC
3750 HACIENDA BLVD
FT LAUDERDALE, FL 33312
Program Manager: BERNARD S WILLARD
Contract #:
Title: A TANDEM-COIL RARE EARTH ELECTRODYNAMIC SONAR PROJECTOR
Topic #: N90-245 Office: NUSC ID #: 41193

A NEW APPROACH TO A RECENTLY DEVELOPED MOVING-COIL TRANSDUCER CONCEPT IS PROPOSED. THE USE OF A DOUBLE-ENDED RARE EARTH MAGNET ASSEMBLY, CHOSEN FOR ITS LOW LEAKAGE FLUX, IS APPLIED TO A SINGLE ENDED TRANSDUCER BY MECHANICALLY CONNECTING THE COILS SITUATED IN EACH END OF THE ASSEMBLY. IT IS CLAIMED THAT MAXIMUM SOUND PRESSURE LEVEL (SOURCE LEVEL) AND ELECTROACOUSTIC EFFICIENCY WILL DOUBLE COMPARED TO THAT OF A SIMILAR, BUT SINGLE COIL DEVICE, AN IMPROVEMENT IN RELIABILITY IS ALSO EXPECTED BECAUSE OF THE INHERENT ABILITY TO BETTER CONTROL PISTON ALIGNMENT. IMPROVED MAGNETIC MATERIALS AND COIL CONSTRUCTION ARE ALSO PROPOSED.

TECHNICAL RESEARCH ASSOCS INC
410 CHIPETA WY - STE 222
SALT LAKE CITY, UT 84108
Program Manager: DILIP N G ROY
Contract #:
Title: LIVE PLANKTON CHARACTERIZATION IN FLUID FLOW
Topic #: N90-247 Office: NUSC ID #: 41194

THE OBJECTIVE OF THE OVERALL PROJECT IS TO CHARACTERIZE LIVING MARINE PLANKTON IN REGARD TO THEIR PHYSICAL PROPERTIES AS WELL AS THEIR INTERACTIONS WITH FLOW. SPECIFICALLY, THE CHARACTERIZATION WILL INVOLVE DETERMINATIONS OF THEIR MASS DENSITIES, SORTING THEM ACCORDING TO THEIR SIZES, DRAG FORCES EXPERIENCED BY THEM IN A FLOWING FLUID OVER A RANGE OF PARTICLE REYNOLD'S NUMBERS VARYING FROM STOKES' REGIME TO ROUGHLY 1000, THEIR VELOCITIES IN AND THEIR ORIENTATIONS WITH RESPECT TO FLOW. ACOUSTICAL AND OPTICAL METHODS ARE PROPOSED FOR ESTIMATING THESE PARAMETERS. ACOUSTICAL METHODS WILL INVOLVE RADIATION FORCES IN A PSEUDO-STANDING WAVE FIELD AND THE OPTICAL METHOD PROPOSED IS LASER DOPPLER ANEMOMETRY. PHASE I WORK WILL INVOLVE SIMPLE, STYLIZED EXPERIMENTS WITH PRIMARILY ONLY A SINGLE SPECIES OF PLANKTON AS WELL AS CONTROLLED EXPERIMENTS WITH BEADS OF KNOWN CHARACTERISTICS. MORE REFINED AND DETAILED INVESTIGATIONS WILL BE UNDERTAKEN IN PHASE II.

PRODUCT PLANNING INC

2125 OXFORD RD
DES PLAINES, IL 60018
Program Manager: BERNARD BISHOP
Contract #:
Title: MULTI-LINE ARRAY RETRIEVAL AND STOWAGE SYSTEM
Topic #: N90-248 Office: NUSC ID #: 41195

THE OBJECTIVE OF THIS PROPOSED EXPLORATORY DEVELOPMENT WILL BE TO INVESTIGATE IN-HAULING MULTI-LINE ARRAYS SEPARATELY, USING THE PRINCIPLE OF BI-HELICAL CAMMING. THE FEASIBILITY OF OUR APPROACH WILL BE TESTING USING A MULTI-HAUL ... PRIMARY PURPOSE OF ONE MOCKUP WOULD BE FIRST, TO DETERMINE IF BI-HELICAL CAM SURFACES ARE GEOMETRICALLY EFFECTIVE WHEN APPLIED MULTIPLY; AND SECOND, TO STUDY DYNAMIC TRANSITIONS WHEN CONNECTORS OR ADDITIONAL ARRAYS ARE ENCOUNTERED. THE FINAL DETERMINANT OF SYSTEM EFFECTIVENESS WILL BE REALIABILITY. THE X-DRUM(tm) CAPSTAN MOCKUP WILL HELP DETERMINE IF THE ARRAYS TEND TO CENTER INDEPENDENTLY ON THEIR INDIVIDUAL CAM SURFACE WITHOUT GUIDE FINGERS OR ENTRAPMENTS. THE MOCKUP WILL ... CONVENTIONAL SYSTEMS. SIZE WILL BE GREATLY REDUCED BACAUSE BEND RADIUS IS AN ELLIPTICAL PROJECTION OF THE CABLE PATH. WEIGHT WILL BE REDUCED BECAUSE OF SIZE AND MATERIAL CHANGES. X-DRUM(tm) CAPSTAN CONFIGURATION IS CONDUCTIVE TO SUBMARINE MOUNTING BECAUSE OF ITS LARGE LENGTH TO DIAMETER RATIO AND ITS DESIGNABLE ARRAY EXIT ANGLE.

DYNAMICS TECHNOLOGY INC
21311 HAWTHORNE BLVD - STE 300
TORRANCE, CA 90503
Program Manager: DAVID G McCOMB
Contract #:
Title: OPTICAL MULTIPLEXED PRELAUNCH COMMUNICATIONS SYSTEM
Topic #: N90-249 Office: NUSC ID #: 41196

PRESENT TORPEDO PRELAUNCH SYSTEMS EMPLOY A MULTI-CONDUCTOR UMBILICAL ... AT THE BREECH DOOR END AS THE COMMUNICATION LINK. EACH WEAPON TYPE HAS IT'S OWN UNIQUE CABLE VARIATION. UNRELIABILITY DUE TO SEAWATER CONTAMINATION, AND LENGTHY PROCEDURES TO READY THE TORPEDO, RECOMMEND THAT ALTERNATE METHODS OF PRELAUNCH COMMUNICATIONS BE INVESTIGATED. WE ARE PROPOSING TO REPLACE THE PRESENT SYSTEM USING THE UMBILICAL CABLE, WITH A BI-DIRECTIONAL, DOUBLE REDUNDANT, SERIAL OPTICAL LINK. THIS LINK WILL CONSIST OF SMALL OPTICAL TRANSMITTER/ RECEIVERS (OPTICAL COUPLERS) LOCATED IN THE TORPEDO AND IN THE ... THERE WILL BE NO SET-UP PROCEDURE OTHER THAN TO PLACE THE TORPEDO IN THE TUBE AND CLOSE THE BREECH DOOR. THE COUPLERS WILL BECOME AN ELEMENT OF A MIL-STD 1553B DUAL REDUNDANT SERIAL DATA BUS WHICH WILL PLACE THE FIRE CONTROL COMPUTER IN CONSTANT COMMUNICATION WITH ALL OF THE SHIPS TORPEDO TUBES AND WHICHEVER TORPEDOES ARE LOADED REGARDLESS OF TYPE. ALL OTHER BUS ELECTRONIC ELEMENTS WILL BE SMALL, LOW POWER, HYBRID UNITS CURRENTLY IN PRODUCTION.

XEMET INC
18804 NORTH CREEK PKWY - #110
BOTHELL, WA 98011
Program Manager: RICHARD B MINCH
Contract #:
Title: QUIET HIGH-PERFORMANCE SUPER-HEATED STEAM VALVE
Topic #: N90-250 Office: NUSC ID #: 41197

A VERY QUIET HIGH-TEMPERATURE (1600 DEGREE F), HIGH-PRESSURE (1000 PSI) STEAM THROTTLE VALVE IS PROPOSED WHICH IS COMPACT (40 IN3), LIGHTWEIGHT (10LBS.) USES LESS THAN 100 WATTS AND IS FAST

(LESS THAN 200 MS FULL STROKE THE DESIGN LIMITS EROSION TO VERY LOW VALUES WITH COMPONENTS WHICH ARE ALL MADE FROM COMMON GRADES OF AUSTENITIC STAINLESS STEELS. PRELIMINARY NOISE LEVELS AND SPECTRA ARE CALCULATED AND COMPARED TO STANDARD VALVES WITH STELLITE SEATS. SEATS. STRESS REPUTURE CALCULATIONS ARE PERFORMED. POWER REQUIRE- MENTS ARE CALCULATED. THERMAL AND STRESS ANALYSIS ARE PROPOSED AND A TEST PROGRAM OUTLINED.

ADVANCED OPTICAL SYSTEMS INC
1103 DEBORAH DR
HUNTSVILLE, AL 35801
Program Manager: RICHARD L HARTMAN
Contract #:
Title: AIRCRAFT LANDING OPTICAL RECOGNITION EXPERIEMENT (ALORE)
Topic #: N90-252 Office: NAEC ID #: 41198

THE NAVY DESIRES AN OPTICAL CORRELATOR SYSTEM TO DETERMINE AIRCRAFT PARAMETERS DURING THE TERMINAL PHASE OF LANDING ON AIRCRAFT CARRIERS. THE FOUNDER OF ADVANCED OPTICAL SYSTEMS, INC. (AOS) CONCEIVED AND DEVELOPED A SERIES OF OPTICAL CORRELATORS FOR MISE. TERMINAL GUIDANCE AND FOR SMART BOMBS. WE DEVELOPED A MULTICHANNEL TRACKING CORRELATOR WHICH WE PROPOSE TO APPLY TO THE AIRCRAFT LANDING PROBLEM. THE SYSTEM CONTINUALLY TRACKS AND COMPENSATES FOR THE SCALE OF THE TARGET. THUS THE SEARCH FOR WHEELS AND TAILHOOK IS AT A KNOWN SCALE. OUR EXPERIENCE IN MISSILE AND BOMB TERMINAL GUIDANCE MAKES US A LEADING CANDIDATE TO DETERMINE THE POTENTIAL OF OPTICAL CORRELATORS FOR AIRCRAFT TERMINAL PHASE OF LANDING. OUR ACCESS TO STATE OF THE ART CORRELATORS FOR AND TAILHOOK IS AT A KNOWN SCALE. OUR EXPERIENCE IN MISSILE AND BOMB TERMINAL GUIDANCE MAKES US A LEADING CANDIDATE TO DETERMINE THE POTENTIAL OF OPTICAL CORRELATORS FOR AIRCRAFT TERMINAL PHASE OF LANDING. OUR ACCESS TO STATE OF THE ART CORRELATORS FOR DESIGNING A SYSTEM FOR SHIPBOARD OPERATION. WE PREDICT SYSTEM PERFORMANCE: TRACKING - THREE MILES TO 100 FEET, INCLUDING AZIMUTH, ELEVATION, AND RANGE; IDENTIFICATION - TWO MILES; WHEELS DOWN -T ONE AND ONE HALF MILES; AND HOOK DOWN - ONE MILE.

FLAM & RUSSELL INC
PO BOX 999
HORSHAM, PA 19044
Program Manager: R MATYSKIELA
Contract #:
Title: RADAR CROSS SECTION VALIDATION
Topic #: N90-253 Office: NADC ID #: 41005

JUST AS WITH OTHER ON-BOARD COUNTER MEASURES SYSTEMS, THE RCS OF LO AIRCRAFT REQUIRES PERFORMANCE VERIFICATION PRIOR TO MISSION DEPLOYMENT. THIS PHASE I PROPOSAL OUTLINES A PROGRAM OF STUDY THAT WILL DEFINE THE SPECIFICATIONS FOR AN RCS VALIDATION RADAR SUITE AND ITS HARDWARE REALIZATION. THIS PROPOSAL SPECIFICALLY ADDRESSES AN OPERATIONAL APPLICATION IN A NAVAL BATTLE GROUP, WHERE AIRCRAFT EMPLOYING LO TECHNIQUES AS A COUNTER MEASURE MUST RECEIVE FAST PRE-MISSION AND POST-REPAIR RCS PERFORMANCE CHECKS AS WELL AS FAULT DIAGNOSIS. THIS PROGRAM FEATURES CONSIDERATION OF 4 SCENARIOS AND WILL EMPLOY PROVEN TEST EQUIPMENT SUCH AS THE HP 8510 AND RADAR INSTRUMENTATION RECEIVERS WERE APPLICABLE. IN ADDITION STATE-OF-THE-ART SIGNAL PROCESSING TECHNIQUES WILL BE EMPLOYED.

METRATEK INC
5205 LEESBURG PIKE - STE 1300

FALLS CHURCH, VA 22041
Program Manager: JOHN W GRAY
Contract #:
Title: RCS VALIDATION IMAGING RADAR
Topic #: N90-253 Office: NAEC ID #: 41006

THE PROPOSED PROGRAM WILL RESULT IN A MAJOR ADVANCEMENT IN THE CURRENT ABILITY TO MAINTAIN AND DIAGNOSE THE RADAR CROSS SECTION (RCS) INTEGRITY OF MODERN MILITARY AIRCRAFT. THE OBJECTIVE OF THE EFFORT IS TO DEFINE A RADAR AND HIGH-SPEED DATA PROCESSING SYSTEM THAT MEETS NAVY AND MARINE CORPS SERVICE REQUIREMENTS FOR HIGH TECHNOLOGY MULTIFREQUENCY OPERATIONAL AIRCRAFT RCS DIAGNOSTIC MEASUREMENT, BY APPLYING THE TECHNOLOGY DEVELOPED AT METRATEK FOR THE HIGH PERFORMANCE MODEL 200 RADAR. THE RESULTING RADAR WILL ALSO SERVE THE NEEDS OF OTHER SERVICES AND GOVERNMENT FACILITIES.

ELECTRONICS WARFARE ASSOCS INC
2071 CHAIN BRIDGE RD
VIENNA, VA 22180
Program Manager: JOHN COTTON JR
Contract #:
Title: DERIVATION OF FUNCTIONAL TESTING REQUIREMENTS FROM WEAPON SYSTEM MISSION REQUIREMENTS
Topic #: N90-254 Office: NAEC ID #: 41007

THIS PROPOSED PROGRAM WILL EXAMINE PARAMETRIC AND FUNCTIONAL TESTING REQUIREMENTS AND DEVELOP THE RATIONAL FOR COMPARING THE EFFECTIVENESS OF THE TWO. FUNCTIONAL TESTING ADDRESSES THE TOTAL WEAPON SYSTEM ABILITY TO MEET THE MISSION REQUIREMENTS RATHER THAN EVALUATING THE INDIVIDUAL SYSTEM PARAMETERS. PARAMETRIC TESTING MAY REQUIRE SERIAL TESTING THAT CAN BE TIME CONSUMING AND THUS VERY COSTLY. ALSO, ONE PARAMETER VALUE MAY BE INFLUENCED BY OTHER PARAMETERS WHICH CAN FURTHER COMPLICATE THE TESTING PROCEDURE AND RESULTS. THUS, AN ASSESSMENT OF THE BENEFITS OF FUNCTIONAL TESTING VERSUS PARAMETRIC TESTING IS THE GOAL OF THIS PHASE I EFFORT. THE PHASE I EFFORT WILL FORMULATE THE CONCEPTS FOR QUALITY FUNCTIONAL TESTING AND IDENTIFY THE DATA NEEDED TO DEVELOP FUNCTIONAL TEST METHODOLOGIES.

COMPEER INC
1409 GRAYWOOD DR
SAN JOSE, CA 95129
Program Manager: RICHARD H MOYER
Contract #:
Title: ADVANCED MODULATION DOMAIN EMITTER SORTING CHARACTERIZATION AND IDENTIFICATION TECHNIQUES
Topic #: N90-255 Office: PMTC ID #: 41008

POTENTIAL SORTING TECHNIQUES FOR USE BY RADAR WARNING RECEIVERS (RWR) AND DECEPTION ELECTRONIC WARFARE (DECM) SYSTEMS ARE IDENTIFIED FOR HANDLING ADVANCED EMITTERS DISPLAYING COMPLEX MODULATION TYPES. THEIR EXPECTED PERFORMANCE IS ANALYZED IN TERMS OF THEIR CAPABILITY TO MEET PROCESSING SPEED, ACCURACY, AND PARAMETER MEASUREMENT REQUIREMENTS. THE INVESTIGATION ALSO DESCRIBES THE HARDWARE AND SOFTWARE IMPLEMENTATION IMPLICATIONS FOR EACH TECHNIQUE AND INVOLVES GENERATING SPECIFICATIONS FOR THE OPTIMUM TECHNIQUES, DEMONSTRATING THE PERFORMANCE USING A BRASSBOARD, AND PROVING THE FEASIBILITY OF INCORPORATING THESE NEW TECHNIQUES INTO PRESENT RWRs AND DECM SUITES. THE TECHNIQUES DEVELOPED ARE CAPABLE OF PROVIDING FAST, ACCURATE, AND HIGH RESOLUTION OF INTRAPULSE SIGNAL CHARACTERISTICS SUCH AS FREQUENCY (CHIRP), PHASE (PSK), AND MODULATION LINEARITY,

PHASE SHIFT AND CORRESPONDING PSK CODE LENGTH/BIT LENGTH, ETC. FOR USE IN SIGNAL SORTING AND CATALOGING. THE TECHNIQUES DEVELOPED ALSO ALLOW FOR AND WOULD SUPPORT 1). ALLOWING EMITTERS AND/OR PLATFORM FINGERPRINTING OF COMPLEX MODULATED SIGNALS BASED ON THE DISTINCTIVE CHARACTERISTICS MEASURED USING NEW SORTING TECHNIQUES AND 2). SUPPORTING THE REGENERATION OF THE RECEIVED SIGNALS AT A LATER TIME FOR DECEPTION JAMMING.

DELFIN SYSTEMS
1349 MOFFETT PARK DR
SUNNYVALE, CA 94089
Program Manager: PAUL L COWELL
Contract #:
Title: MOP-BASED EMITTER CLASSIFICATION SYSTEM
Topic #: N90-255 Office: PMTC ID #: 41199

COMPLEX MODULATIONS USED BY MODERN RADAR SYSTEMS PRESENT PROBLEMS FOR CURRENT ESM SYSTEMS INCLUDING FAILURE TO DETECT, MEASURE OR RECOGNIZE EMITTERS. THE OBJECTIVE OF THIS EFFORT IS TO IDENTIFY RADAR PULSE SORTING TECHNIQUES FOR MODERN EMITTERS ESPECIALLY THOSE EMPLOYING COMPLEX MODULATIONS, THAT CAN PROVIDE DETECTION, SIGNAL SORTING, HIGH RESOLUTION PARAMETER MEASUREMENT, IDENTIFICATION AND A BASIC FOR JAMMING. THE OBJECTIVES WILL BE ACCOMPLISHED BY DESIGNING AND EVALUATING A MODULATION-BASED SYSTEM FOR RAPIDLY MEASURING MODULATION IN PULSE, EXTRACTING MODULATION FEATURES, SORTING PULSES ON THE BASIS OF MOP AND IDENTIFYING SIGNAL BASED ON MOP. THE SYSTEM WILL BE BASED ON PARALLEL HARDWARE ARCHITECTURE AND CUSTOM HARDWARE COMPONENTS TO ACHIEVE THE DESIRED SPEED. GENERIC FEATURE EXTRACTION ALGORITHMS WILL ALLOW ANY INTENTIONAL OR UNINTENTIONAL MODULATION TO BE PROCESSED. THE SYSTEM WILL BE EVALUATED USING A DETAILED COMPUTER SIMULATION OF BOTH HARDWARE AND SOFTWARE-BASED PROCESSING ALGORITHMS AND EMPLOY REALISTIC DATA. THE RESULT OF THE EFFORT WILL BE A DETAILED SYSTEM DESIGN READY FOR IMPLEMENTATION AND FIELD TESTING AND A REPORT ON THE RESULTS OF THE WORK.

SIG-PRO SYSTEMS INC
1121 BALDWIN ST
SALINAS, CA 93906
Program Manager: LONNIE A WILSON
Contract #:
Title: NEW ESM CLASSIFICATION AND ID TECHNIQUES
Topic #: N90-256 Office: PMTC ID #: 41200

NEW ESM PROCESSORS ARE REQUIRED TO SOLVE EMITTER CLASSIFICATION AND ID PROBLEMS WHICH ARE COMPLICATED BY COMPLEX AND DENSE EMITTER ENVIRONMENTS AND FURTHER COMPOUNDED BY MODERN LPI RADAR WAVEFORMS. NEW CLASSIFICATION AND ID PARAMETERS WILL BE EXTRACTED IN REAL-TIME, AND CLASSIFICATION ANALYSIS PERFORMED. SIG-PRO'S NEW AND POWERFUL FEATURE EXTRACTION ALGORITHM WILL BE USED IN CONJUNCTION WITH AN ADVANCED CORRELATION CLASSIFIER TO PERFORM ESM EMITTER CLASSIFICATION AND ID, AND POTENTIALLY PERFORM PLATFORM ID.

INFRARED FIBER SYSTEMS INC
2301-A BROADBIRCH DR
SILVER SPRING, MD 20904
Program Manager: DR KENNETH H LEVIN
Contract #:
Title: IMAGING SPECTROMETER USING THE ACOUSTO-OPTIC TUNABLE FILTER

Topic #: N90-257 Office: PMTC ID #: 41201

WE PROPOSE TO DEVELOP AN IMAGING SPECTROMETER BASED ON THE ACOUSTO-OPTIC TUNABLE FIBER (AOTF) COUPLED TO INFRARED ARRAY DETECTORS FOR INFRARED SIGNATURE MEASUREMENTS OF LOW-OBSERVABLE AIRCRAFT. THE AOTF IS A MINIATURE, HIGH SPEED, AND RUGGED DEVICE MADE FROM BIREFRINGENT CRYSTAL SUCH AS TeO2, AND CAPABLE OF TRANSMITTING A SPECTRAL IMAGE. DURING PHASE I, WE WILL MODIFY AN EXISTING AOTF SPECTROMETER WE HAVE DEVELOPED TO ADD IMAGING CAPABILITY. THIS IMAGE WILL BE FOCUSED ONTO A CCD CAMERA FOR THE PHASE I FEASIBILITY STUDIES IN THE NEAR-INFRARED. THE AOTF DEVICE WILL BE OPTIMIZED FOR IMAGING BY INCREASING THE ACCEPTANCE ANGLE AND ACTIVE APERTURE OF THE DEVICE. WE WILL DETERMINE THE PERFORMANCE OF THE SYSTEM BY MEASURING THE SPECTRAL AND SPATIAL RESOLUTION, SPEED AND WAVELENGTH RANGE. WE WILL USE THIS SYSTEM TO SCAN THROUGH THE ABSORPTION BANDS OF TEST SAMPLES. DURING PHASE II, THE AOTF WILL BE FURTHER IMPROVED, AND THE SPECTRAL RANGE WILL BE EXTENDED TO LONGER WAVELENGTHS BY USING OTHER CRYSTAL MATERIALS AND INFRARED FOCAL PLANE ARRAY DETECTORS OR CONVENTIONAL THERMOGRAPHIC CAMERAS. IN ADDITION, WE WILL DEVELOP HIGH SPEED DATA ACQUISITION HARFWARE AND SOFTWARE TO CONTROL THE AOTF AND PROCESS THE DATA.

SCIENTIFIC RESEARCH ASSOCS INC
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
Program Manager: DR SALVADOR M FERNANDEX
Contract #:
Title: ACOUSTOOPTIC IR IMAGING SPECTROMETER
Topic #: N90-257 Office: PMTC ID #: 41202

AN INNOVATIVE CONCEPT FOR A TUNABLE IMAGING IR SPECTROMETER IS PROPOSED. THE DEVICE WILL CONSIST OF AN ACOUSTOOPTIC TUNABLE FILTER COUPLED TO A TWO-DIMENSIONAL FOCAL PLANE ARRAY DETECTOR. THIS IMAGING SPECTROMETER WILL COMBINE HIGH THROUGHPUT (APPROACHING 100%) WITH THE TUNABILITY AND HIGH RESOLUTION OF A GRATING SPECTROMETER, AND THE TWO-DIMENSIONAL IMAGING CAPABILITY OF AN INTERFERENCE FILTER. THIS WILL RESULT IN A COMPACT, ALL SOLID-STATE DEVICE WITH MULTISPECTRAL IMAGING CAPABILITY AND WITH HIGH SPATIAL AND SPECTRAL RESOLUTION. THE UNIQUE COMBINATION OF TWO-DIMENSIONAL IMAGING, WITH HIGH SPECTRAL RESOLUTION AND THROUGHPUT, ELECTRONIC TUNABILITY, ALL SOLID-STATE CONSTRUCTION AND NO MOVING PARTS IS NOT CURRENTLY AVAILABLE IN EXISTING INSTRUMENTS. A DEVICE WITH THESE CHARACTERISTICS WOULD BE IDEALLY SUITED FOR AIRBORNE AND SPACE-BASED MEASUREMENTS OF LOW-SIGNATURE AIRCRAFT AND MISSILES.

SYSTEMS EVALUATION LAB IN FLIGHT (SELF)
PO BOX 7836
VAN NUYS, CA 91409
Program Manager: JIM CROSBY
Contract #:
Title: RADAR REFLECTIVITY POLARIZATION MATRIX MEASUREMENT INSTRUMENT
Topic #: N90-258 Office: PMTC ID #: 41041

A PRELIMINARY DESIGN STUDY IS PROPOSED TO CONDUCT A SYSTEMATIC SURVEY AND EVALUATION OF DESIGN CONCEPTS WHICH OFFER PROMISE OF MEETING THE TECHNICAL OBJECTIVES. EXPERIMENTAL MODELS OF PROMISING CANDIDATE DESIGNS WILL BE OBTAINED, MEASUREMENTS WILL BE MADE TO PROVIDE THE DATA FOR EVALUATION AND RECOMMENDATIONS WILL BE MADE TO ASSIST THE GOVERNMENT IN SELECTING THE OPTIMUM DESIGN.

AMHERST SYSTEMS INC
30 WILSON RD
BUFFALO, NY 14221
Program Manager: JOSEPH FRITZ
Contract #:
Title: MULTISPECTRAL TARGET GENERATOR
Topic #: N90-259 Office: PMTC ID #: 41203

THE MULTISPECTRAL TARGET GENERATION SYSTEM (MSTG) IS PROPOSED WHICH WILL PROVIDE DYNAMIC, HIGH-FIDELITY STIMULUS TO DUAL MODE SEEKERS. THE MSTG WILL SUPPORT TEST AND EVALUATION OF ANTI-AIR MISSILE SYSTEMS WHICH EMPLOY ACTIVE RF AND TWO SPECTRUM IR SEEKER SYSTEMS. THE MSTG WILL PROVIDE MULTISPECTRAL STIMULUS REPRESENTING MISSILE ENGAGEMENTS INVOLVING 1-ON-1, OR 1-ON-MANY, WITH COMPLETE FREEDOM OF (SIMULATED) MOTION OF THE IN-THE-LOOP SEEKER. THE MSTG WILL GENERATE COMPLEX, EXTENDED SOURCE TARGETS AND WILL BE ABLE TO DUPLICATE TEST FLIGHT SCENARIOS TO SUPPORT LABORATORY/FLIGHT TEST DATA CORRELATION. IR ECM AND RF ECM WILL BE MODELED. THE MSTG DESIGN IS BASED ON CURRENT AMHERST SYSTEMS PRODUCT EFFORTS. SEEKER DESIGN ANALYSES AND INFORMATION EXCHANGES WITH THE SPONSOR WILL BE PERFORMED TO TAILOR THE MSTG DESIGN TO THE SPONSOR'S REQUIREMENTS.

NORSAL INDUSTRIES INC
85D HOFFMAN LA S
CENTRAL ISLIP, NY 11722
Program Manager: ALEX MARGULIS
Contract #:
Title: MICROWAVE TARGET PRESENTATION FOR MISSILE TEST AND EVALUATION
Topic #: N90-260 Office: PMTC ID #: 41204

THE OBJECTIVE IS TO DEVELOP HARDWARE FOR RF ENVIRONMENT PRESENTATION IN HARDWARE-IN-THE-LOOP MISSILE SYSTEM EVALUATION LABORATORIES. T PRESENT, RF GUIDED MISSILES ARE TESTED IN HARDWARE-IN-THE-LOOP (HIL) LABORATORIES USING ONE OF TWO TECHNIQUES FOR THE PRESENTATION OF TARGET SIGNATURES, JAMMING SOURCES AND ENVIRONMENTAL EFFECTS. THE LESS EXPENSIVE OF THE TWO TECHNIQUES GENERATES APPROPRIATE ANGLES AND ANGULAR RATES USING MICROWAVE HORNS SERVO-POSITIONED IN ONE OR TWO AXES. ADVANTAGES OF THE SERVO-POSITIONED APPROACH INCLUDE MODERATE COST AND THE CAPABILITY TO HANDLE POWER LEVELS REQUIRED FOR SIMULATION OF THREAT REPRESENTATIVE JAMMING SOURCES. DISADVANTAGES OF THE SERVO-POSITIONED HORN TECHNIQUE INCLUDE INABILITY TO REPRESENT TARGET GLINT AND RESTRICTION TO SCENARIOS INCLUDING ONE OR TWO SOURCES. THE SECOND TECHNIQUE EMPLOYS AN ARRAY OF HORNS DRIVEN BY A COMPLET NETWORK OF MICROWAVE DEVICES. ADVANTAGES OF THE HORN ARRAY INCLUDE THE ABILITY TO REPRESENT MANY TARGETS AND TO SIMULATE COMPLEX TARGET SIGNATURE PHENOMENA. DISADVANTAGES INCLUDE COST AND THE INABILITY TO HANDLE THE RELATIVE AND ABSOLUTE POWER LEVELS REQUIRED FOR TESTS IN THE JAMMING ENVIRONMENTS. A MICROWAVE VECTOR VOLTMETER HAS BEEN DEVELOPED THAT IS CAPABLE OF PERFORMING THESE FUNCTIONS OVER A PORTION OF THE MICROWAVE SPECTRUM WHILE OVERCOMING ALL OF THE ABOVE MENTIONED DISADVANTAGES. THE PROCESSING OF A MODULATION SIGNAL INPUT TO THE VECTOR MODULATOR WILL EMPLOY DIRECT DIGITAL SYNTHESIS (DDS) TECHNIQUES.

HOPKINS SOFTWARE
3827 E COLORADO BLVD
PASADENA, CA 91107
Program Manager: RICHARD HOPKINS
Contract #:
Title: REAL-TIME PHOTOGRAPHIC BASED TERRAIN IMAGE GENERATOR WITH CAPABILITIES FOR 3-D OBJECTS
Topic #: N90-261 Office: NTSC ID #: 41011

THERE ARE SIGNIFICANT PROBLEMS WITH THE CURRENT GENERATION OF REAL-TIME IMAGE GENERATORS IN THEIR USE OF PHOTOGRAPHIC TEXTURE AND THEIR LACK OF TERRAIN DETAIL. THE BEST CURRENTLY AVAILABLE REAL-TIME IMAGE GENERATORS MODEL TERRAIN WITH PHOTOGRAPHS MAPPED ONTO POLYGONS. THIS APPROACH PRODUCES IMAGES OF TERRAIN THAT LOOK UNNATURALLY SMOOTH AND FLAT AT LOW ELEVATIONS, AND BLOCKY AT HIGH ELEVATIONS. AN IMAGE GENERATOR ARCHITECTURE WILL BE PROPOSED THAT OVERLAYS PHOTOGRAPHIC IMAGES ONTO DETAILED TERRAIN ELEVATION DATA. IN ADDITION TO THE IMPROVED REALISM, THE PROPOSED ARCHITECTURE IS MODULAR AND EXPANDABLE AND WILL SUPPORT THE RAPID CREATION OF PHOTOGRAPHIC DATABASES.

MCS CORP
1401 WILSON BLVD
ARLINGTON, VA 22209
Program Manager: NORMAN H MacLEOD
Contract #:
Title: REAL-TIME PHOTOGRAPHIC BASED TERRAIN IMAGE GENERATOR WITH CAPABILITIES FOR 3D OBJECTS
Topic #: N90-261 Office: NTSC ID #: 41009

THIS IS A SYSTEMS REQUIREMENTS/PRELIMINARY DESIGN STUDY WHICH WILL INCLUDE A DEMONSTRATION OF A NEAR REAL-TIME TRUE PRESPECTIVE TERRAIN IMAGE GENERATION SYSTEM. THIS SYSTEM WILL HAVE THE CAPABILITY TO INSERT STATIC OR DYNAMIC OBJECTS, SUCH AS BUILDINGS OR VARIOUS TARGET CLASSES, INTO THE DATA BASE. COMMERCIALLY AVAILABLE SOFTWARE, OPTIMIZED FOR THE HOST PROCESSOR, WILL BE EMPLOYED, AND BENCHMARK MEASUREMENTS TAKEN DURING THE DEMONSTRATION WILL BE UTILIZED TO DETERMINE THE EXTENT TO WHICH HARDWARE/SOFTWARE MODIFICATIONS WILL BE REQUIRED TO ACHIEVE REAL-TIME PERFORMANCE DURING PHASE II. THE INTENT UNDERLYING THIS APPROACH IS TO ACHIEVE A HIGH CONFIDENCE LEVEL IN THE PREDICTED PERFORMANCE LEVEL YET AVOID A HIGH SOFTWARE DEVELOPMENT COST. A PROPRIETARY DATA BASE ORGANIZATION AND RETRIEVAL METHOD WILL BE COMBINED WITH A TIME INVARIANT INVERSE RAY TRACING ALGORITHM AND DEMONSTRATED AT A 2 Hz UPDATE RATE. A PHASE II SYSTEM IMPLEMENTATION DESIGN TO COST GOAL OF $300-500K HAS BEEN SET FOR A FULLY INTEGRATED, REAL-TIME SYSTEM WITH INTEGRAL PHOTO DATA BASE GENERATION CAPABILITY.

TAU CORP
485 ALBERTO WY
LOS GATOS, CA 95032
Program Manager: JOHN THOMAS
Contract #:
Title: REAL-TIME PHOTOGRAPHIC BASED TERRAIN IMAGE GENERATOR WITH CAPABILITIES FOR 3-D OBJECTS
Topic #: N90-261 Office: NTSC ID #: 41010

FLIGHT SIMULATORS OF THE FUTURE WILL EMPLOY PHOTO-BASED IMAGE GENERATORS TO CREATE REALISTIC FULL-PHOTOGRAPHIC SIMULATED IMAGES IN REAL TIME. PILOTS IN TRAINING AND ALSO THOSE REHEARSING SPECIFIC MISSIONS WILL NOT BE FLYING THROUGH THE CARTOON-LIKE REALITY OF PAST SIMULATORS BUT THROUGH A PHOTO-REALISTIC REPRESENTATION BASED ON CURRENT IMAGERY. THE TECHNOLOGY TO FACILITATE THIS REVOLUTION IN SIMULATION AND MISSION REHEARSAL IS EMERGING FROM ADVANCES IN IMAGE PROCESSING, BOTH IN THE AREAS OF DATA BASE CONSTRUCTION AND IN REAL-TIME IMAGE GENERATION. ALL OF THE MAJOR SIMULATOR COMPANIES NOW HAVE IMAGE GENERATORS THAT EMPLOY GEO-LOCATED IMAGERY TO SOME EXTENT. DUE TO THE TECHNICAL DIFFICULTIES IN BUILDING THE REQUIRED LARGE PHOTOGRAPHIC DATA BASES AND IN ACCESSING THIS DATA IN REAL TIME, THESE SYSTEMS FALL SHORT OF THE GOAL OF FULL-PHOTOGRAPHIC REALISM. THESE SYSTEMS ARE EXTREMELY EXPENSIVE AND IMMOBILE WHICH SEVERELY LIMITS THERE WIDESPREAD USE. THE PURPOSE OF THE PROPOSED WORK IS TO DEVELOP AN APPROACH TO THE DEVELOPMENT OF A COMPACT, LOW COST, FULL-PHOTOGRAPHIC IMAGE GENERATOR. PHASE II WILL FOLLOW BY ACTUALLY IMPLEMENTING THIS IMAGE GENERATOR AND DEVELOPING A PROTOTYPE SYSTEM.

MERIT TECHNOLOGY INC
5068 W PLANO PKWY
PLANO, TX 75093
Program Manager: RICHARD A BERTHIAUME
Contract #:
Title: LOW COST RECONFIGURABLE COCKPIT FOR DEPLOYABLE AIRCREW TEAM TRAINING
Topic #: N90-262 Office: NTSC ID #: 41012

MERIT PROPOSES TO DESIGN AN INNOVATIVE RECONFIGURABLE COCKPIT WHICH IS BASED ON MODULAR HARDWARE, COMPUTING, AND SOFTWARE ARCHITECTURES. THE MODULARIZATION OF HARDWARE STRUCTURES AND STANDARDIZATION OF ELECTRONIC INTERCONNECTS IS COMBINED WITH DISTRIBUTED PROCESSING, GRAPHICAL USER INTERFACES, AND OBJECT-ORIENTED SOFTWARE TO ACHIEVE THE DESIRED RESULT. THE RESULTING COCKPIT WILL BE EASY TO RECONFIGURE, IT WILL OFFER HIGH PERFORMANCE WHICH CAN EASILY BE ENHANCED FOR ADDITIONAL APPLICATIONS, AND IT WILL MINIMIZE COSTS OF CONSTRUCTION AND MODIFICATION.

SYMVIONICS INC
PO BOX 5023
WHITTIER, CA 90607
Program Manager: RICHARD A WEEKS
Contract #:
Title: MODULARIZED RECONFIGURABLE COCKPIT FOR DEPLOYABLE AIRCREW TEAM TRAINERS
Topic #: N90-262 Office: NTSC ID #: 41013

AIRCRAFT SIMULATOR SYSTEMS, UTILIZED IN THE TRAINING OF AIRCREWS, REQUIRE A REALISTIC REPRESENTATION OF THE CREW STATION. FURTHERMORE, WHEN ONLY A FEW TRAINING SYSTEMS ARE AVAILABLE, DUE TO COST AND SPACE CONSTRAINTS, IT BECOMES NECESSARY TO TIME SHARE THESE SIMULATOR SYSTEM RESOURCES IN MANNER SUCH THAT THE TRAINING SIMULATOR REPRESENTS A VARIETY OF AIRCRAFT. THIS CONCEPT REQUIRES THE USE OF INTERCHANGEABLE COCKPIT REPRESENTATIONS. HOWEVER, IT IS ALSO NECESSARY TO PROVIDE THIS CREW STATION RECONFIGURATION IN A TIMELY MANNER. THIS STUDY WILL CREATE A PRELIMINARY DESIGN FOR A MODULAR, RECONFIGURABLE COCKPIT, WHICH CAN BE UTILIZED IN DEPLOYABLE AIRCREW TEAM TRAINERS. THE DESIGN WILL PERMIT THE RAPID RECONFIGURATION OF A SIMULATOR COCKPIT IN ORDER TO REPRESENT A VARIETY OF AIRCRAFT COCKPITS. ALL MECHANICAL, ELECTRICAL AND COMPUTER SOFTWARE ISSUES WILL BE ADDRESSED IN THIS STUDY.

SBS ENGINEERING/RAFFO ENTERPRISES INC
5301 CENTRAL AVE NE
ALBUQUERQUE, NM 87108
Program Manager: D H ALEXANDER/J RAFFO
Contract #:
Title: ENGINEERING DEVELOPMENT OF ON-LINE DIAGNOSTIC SYSTEM FOR SIMULTOR PERFORMANCE MONITORING
Topic #: N90-263 Office: NTSC ID #: 41014

THE PERFORMANCE TRANSFER FROM A TRAINING SIMULATOR TO THE OPERATIONAL EQUIPMENT IS DIRECTLY RELATED TO THE FIDELITY OF THE SIMULATOR. SUBTLE CHANGES IN THE RELATIVE DYNAMIC, MOTION AND/OR VISUAL SYSTEM PERFORMANCE CAN BE DETECTED BY THE TRAINEE RESULTING IN ADVERSE PHYSICAL REACTIONS (OFTEN REFERRED TO AS "SIMULATOR SICKNESS"), AND CORRESPONDING DEGRADATION IN THE TRAINING EFFECTIVENESS. THE ADVENT OF CURRENT STATE-OF-THE-ART

MICROPROCESSORS PROVIDES FOR THE DEVELOPMENT OF A GENERIC ON-LINE DIAGNOSTIC SYSTEM FOR SIMULATOR PERFORMANCE MONITORING. THIS TYPE OF SYSTEM, USING HISTORICAL DATA AND RULES OF OPERATION, CAN DETECT CHANGES IN SIMULATOR PERFORMANCE AND IDENTIFY RECOMMENDED PREVENTIVE MAINTENANCE PRIOR TO THE LEVEL OF PERFORMANCE DEGRADATION REACHING STUDENT *DETECTABLE THRESHOLDS. THE POTENTIAL IMPROVEMENT IN TRAINING EFFECTIVENESS* AND AVAILABILITY MAKES THIS TYPE OF MONITORING ATTRACTIVE FOR BOTH GOVERNMENT AND COMMERCIAL MOTION BASE SIMULATORS.

ISERA GROUP
3463 STATE ST - STE 246
SANTA BARBARA, CA 93105
Program Manager: CRAIG BLOXHAM
Contract #:
Title: INITIAL DESIGN DEVELOPMENT AND SPECIFICATIONS FOR THE TOURS SYSTEM
Topic #: N90-264 Office: NTSC ID #: 41015

OPTIMIZATION OF TRAINING SCHEDULES AND RESOURCE USE CAN PLAY A MAJOR ROLE IN MAINTAINING TRAINING EFFECTIVENESS, MINIMIZING TRAINING COSTS, AND REDUCING THE TOTAL AMOUNT OF RESOURCES REQUIRED. THE MAJOR OBJECTIVE OF THE PHASE I TOURS EFFORT IS TO PROVIDE THE COMPREHENSIVE DESIGN SPECIFICATIONS FOR AN INTERACTIVE SYSTEM OF MATHEMATICAL MODELS, ALGORITHMS, AND DATA STRUCTURES THAT WILL FACILITATE THE PLANNING ANALYSIS AND OPTIMIZATION OF NAVY TRAINING SCHEDULES. THIS WORK WILL IDENTIFY THE SPECIFIC SCHEDULING OBJECTIVES, CONSTRAINTS, AND FUNCTIONAL REQUIREMENTS OF NAVY SCHOOLHOUSES AND PROPOSE A FLEXIBLE METHODOLOGY TO PRODUCE AND ANALYZE ALTERNATIVE TRAINING STRATEGIES AND SCHEDULES. SPECIFIC SOFTWARE LANGUAGES AND TOOLS WILL BE RECOMMENDED AS A BASIS FOR THE SOFTWARE DEVELOPMENT IN PHASE II.

CEMCOM RESEARCH ASSOCS INC
10123 SENATE DR
LANHAM, MD 20706
Program Manager: DR SEAN WISE
Contract #:
Title: A MECHANISTIC APPROACH TO DESIGN AND UNDERSTANDING OF HEAT RESISTANCE IN AIRFIELD PAVEMENTS
Topic #: N90-267 Office: NCEL ID #: 41205

THE MECHANISM OF CONVECTIVE HEATING INDUCED SPALL FORMATION IN AIRFIELD PAVEMENTS WILL BE STUDIED. THE OBJECTIVE WILL BE TO DETERMINE THE IMPORTANT PARAMETERS RELATED TO DESIGNING HEAT RESISTANT PAVEMENTS WHILE MAINTAINING OR IMPROVING RESISTANCE TO FUEL, HYDRAULIC FLUID AND DE-ICING CHEMICALS. THE PROJECT WILL BEGIN WITH A LITERATURE REVIEW TO PREPARE A DATABASE OF HEAT RESISTANT CONCRETES AND PAVEMENT DESIGNS CURRENTLY IN USE AND TO CLASSIFY THEIR PERFORMANCE RELATIVE TO COMPOSITION. A SIMPLE CONVECTIVE HEAT TRANSFER MODEL WILL BE USED TO EXAMINE THERMAL GRADIENTS IN CONCRETES GENERATED BY TURBINE EXHAUST HEATING. THESE THERMAL GRADIENTS WILL BE USED IN A FINITE ELEMENT MODEL TO LOOK AT SIMPLE HEAT INDUCED STRESSES. ADDITIONALLY, THE EFFECT OF PORTLAND CEMENT DEHYDRATION WILL BE EXAMINED TO SEE HOW THIS AFFECTS THE BINDER AND THE BINDER AGGREGATE BOND. THE MODELING WILL BE BACKED UP BY EXPERIMENTAL TESTS TO LOOK INTO THERMAL PROFILES OF CONVECTIVELY HEATED PAVEMENTS. TESTS WILL BE CONDUCTED TO DELINEATE THE RELATIVE SIGNIFICANCE OF SIMPLE THERMAL STRESS VERSUS SHRINKAGE AND DECOMPOSITION OF THE CEMETITIOUS BINDER. THE DATABASE AND MECHANISTIC TESTING WILL BE COMPARED TO DETERMINE IF FIELD PERFORMANCE IS CONSISTANT WITH THE MECHANISTIC TESTING. FROM THIS, PAVEMENT DESIGNS WILL BE IDENTIFIED THAT MEET OR EXCEED THE THERMAL AND ENVIRONMENTAL STABILITY REQUIREMENTS.

CEMCOM RESEARCH ASSOCS INC
10123 SENATE DR
LANHAM, MD 20706
Program Manager: DR RANDALL P BRIGHT
Contract #:
Title: DEVELOPMENT OF CBC/PTC COMPOSITE WALL MATERIALS TO PREVENT SYMPATHETIC DETONATION BETWEEN WEAPONS STORAGE CELLS
Topic #: N90-268 Office: NCEL ID #: 41206

A SERIES OF INNOVATIVE MATERIALS AND COMPOSITE WALL DESIGN CONCEPTS WILL BE IDENTIIED TO PREVENT SYMPATHETIC DETONATION IN A NEW WEAPONS STORAGE SYSTEM. THIS WILL BE DONE IN FIVE STEPS. THE ENGINEERING DESIGN PARAMETERS WILL BE ESTIMATED. NOVEL MATERIALS AND INNOVATIVE DESIGN CONCEPTS WILL BE GENERATED USING CHEMICALLY BONDED CERAMICS IN COMBINATION WITH PYRAMIDAL TRUSS CORE SANDWICH PANEL STRUCTURES. A FINITE ELEMENT ANALYSIS MODEL WILL BE DEVELOPED TO SIMULATE THE CAPACITY OF VARIOUS COMPOSITE WALL DESIGNS TO MITIGATE THE EXPLOSIVES EFFECTS AND PREVENT SYMPATHETIC DETONATION. THIS MODEL WILL THEN BE USED TO EVALUATE THE VARIOUS CANDIDATE WALL DESIGNS. FINALLY, THE COST, WEIGHT AND SPACE EFFICIENCIES OF SELECTED WALL DESIGNS WILL BE ASSESSED.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
Program Manager: ARNIS MANGOLDS
Contract #:
Title: DIVER-INSTALLED RECOILLESS PROPELLANT EMBEDDED ANCHOR (RPEA)
Topic #: N90-269 Office: NCEL ID #: 41207

A PROPELLANT-ACTUATED ANCHOR USABLE AT ANY UNDERWATER DEPTH OR IN THE OPEN AIR, THAT IS ALSO LIGHT AND COMPACT ENOUGH FOR DEPLOYMENT BY DIVERS, IS DESIRED. WHERES EXISTING UNDERWATER EMBEDMENT GUNS USE REACTION VESSELS TO RESIST RECOIL FORCES UNDERWATER, THESE GUNS WOULD RECOIL HIGH INTO THE AIR IF FIRED ON LAND. A RECOILLESS GUN HAS BEEN SUGGESTED IN THE RFP. UNFORTUNATELY, THESE EXPEL GREAT VOLUMES OF GAS TO THE REAR, WHICH COULD BE PROBLEMATIC. VARIOUS SOLUTIONS ARE PROPOSED. THE GAS CAN BE DIMINISHED BY MULTIPHASED ENERGY RELEASE, WHEREBY A LOW-POWER CHARGE INITIALLY LAUNCHES THE ANCHOR PROJECTILE INTO THE SEAFLOOR, AFTER WHICH ONBOARD PROPELLANTS DRIVE THE ANCHOR DEEPER. ROCKET LAUNCH AND A CONVERTIBLE RECOILLESS/ CONVENTIONAL GUN IS DISCUSSED. EFFICIENT TIPPING PLATE ANCHORS WHICH MAY WORK AT LESS EMBEDMENT DEPTH ARE DESCRIBED. THESE AND OTHER INNOVATIONS, WHICH USED SINGLY OR IN COMBINATION, WOULD MAKE VERY HIGH CAPACITY ANCHORS POSSIBLE, CAPACITY.

ADVANCED ENGINEERING & RSCH ASSOCS INC
1745 JEFFERSON DAVIS HWY - STE 500
ARLINGTON, VA 22202
Program Manager: CHARLES B FRANKS
Contract #:
Title: A MODEL FOR PREDICTING THE PERFORMANCE DETERIORATION IN GAS TURBINE ENGINES
Topic #: N90-270 Office: NAPC ID #: 41017

A MODEL FOR PREDICTING THE PERFORMANCE IMPACT OF ENGINE DETERIORATION IS PROPOSED FOR FEASIBILITY EVALUATION. THIS MODEL WOULD ACCOUNT FOR ROTATING COMPONENT DETERIORATION SUCH AS INCREASED TIP CLEARANCES, SURFACE ROUGHNESS, LEADING EDGE BLUNTNESS AND VAN BOW AND TWIST. THE PROPOSED APPROACH USES A STAGE STACKING METHOD TO ALLOCATE LOSSES

THROUGHOUT THE ENGINE WHICH ARE DEPENDENT ON OPERATING TIMES AND COMPONENT OPERATING PARAMETERS. THESE PARAMETERS ARE RELATED BACK TO ENGINE MISSION PROFILE SO THAT ALL OF THE NAVY MISSION PROFILES CAN BE ANALYZED USING THE FINAL MODEL. PREDICTED PERFORMANCE USING ENGINE SIMULATION DECKS WILL BE COMPARED WITH ACTUAL ENGINE TEST DATA TO VERIFY THE PERFORMANCE DETERIORATION MODEL.

DYNAFLOW INC
7210 PINDELL SCHOOL RD
LAUREL, MD 20707
Program Manager: A N LAKSHMINARASIMHA
Contract #:
Title: TURBINE ENGINE COMPONENT DETERIORATION MODEL
Topic #: N90-270 Office: NAPC ID #: 41016

THE EXISTING GASTURBINE PERFORMANCE DETERIORATION SIMULATION METHODS ARE EITHER TOO SIMPLE OR TOO SOPHISTICATED TO BE OF GENERAL USE. GAS TURBINE DETERIORATION MODELS BASED ON STAGE CHARACTERISTICS, AND STAGE STACKING METHODS ARE PROPOSED TO ALLEVIATE THIS DRAWBACK. THE STAGE CHARACTERISTICS WILL BE FIRST DEVELOPED FOR THE CASE WHEN THE STAGES ARE NOT DETERIORATED, AND WILL BE STACKED TOGETHER TO DEVELOP BASELINE COMPONENT PERFORMANCE MAP. THEN USING FIRST PRINCIPLES, THE EFFECTS OF DIFFERENT TYPES OF FUALTS, VIZ., a) EROSION, b) FOULING, c) FOD, d) TIP CLEARANCE e) WATER INGESTION WILL BE SIMULATED TO REFLECT THE EFFECTS OF THESE ON THE STAGE PERFORMANCE CHARACTERISTICS. THE RELATIVE EFFECTS OF THESE FAULTS ARE PROPOSED TO BE STUDIED FIRST ON THE STAGE OR SUBCOMPONENT LEVEL. THEN, USING STAGE-STACKING PROCEDURE, THE EFFECT OF EACH OF THE ABOVE FAULTS AND A COMBINATION OF THESE WOULD BE STUDIED IN DETAIL. DUE TO THE LARGE AMOUNT OF DATA THAT NEED TO BE HANDELED IN SUCH A COMPARITIVE STUDY, A CORRELATION PROCEDURE WILL BE DEVELOPED, IN WHICH THE RELATIVE PERFORMANCE OF ALL THE STAGES COULD BE REPRESENTED ALONG WITH THE OVERALL COMPONENT PERFORMANCE. A COMPONENT LEVEL COMPUTER PROGRAM CAPABLE OF SIMULATING DIFFERENT TYPES OF FAULTS WOULD BE DEVELOPED IN PHASE I. THIS WOULD BE USED IN PHASE II, WHERE DIFFERENT COMPONENT PERFORMANCE PARAMETERS DEPENDING ON THE CYCLE WOULD BE LINKED USING COMPRESSOR- TURBINE MATCHING CALCULATIONS, TO SEEK THE EFFECT OF THE FAULT OF A COMPONENT ON THE OVERALL ENGINE PARAMETERS, WHICH IS THE FINAL GOAL OF THE PROJECT. AN IMPORTANT FEATURE OF THE PROPOSED TECHNIQUE IS THAT IT COULD BE USED FOR EXISTING AS WELL AS NEW ENGINE CYCLES. THE PROPOSED PROCEDURE ALSO HAS ITS ATTRACTIVENESS FROM QUANTIFICATION OF THE EFFECTS OF FAULT AS WELL AS IN THE DEVELOPMENT OF FAULT MATRICES FOR DIFFERENT TYPES OF FAULT AND ENGINE COMBINATIONS.

SCIENTIFIC RESEARCH ASSOCS INC
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
Program Manager: DR STEPHEN J SHAMROTH
Contract #:
Title: BOUNDARY LAYER CONTROL DEVICES FOR GAS TURBINE ENGINES
Topic #: N90-271 Office: NAPC ID #: 41208

AN INNOVATIVE APPROACH IS PROPOSED TO DEVELOP STATE-OF-THE-ART VORTEX GENERATORS FOR SUPPRESSION OF BOUNDARY LYER SEPARATION ON COMPRESSOR BLADES OPERATING UNDER TRANSONIC, HIGH LOAD CONDITIONS. THE COMBINED PHASE I/PHASE II PROGRAM WOULD BE PERFORMED BY SCIENTIFIC RESEARCH ASSOCIATES IN COOPERATION WITH PRATT & WHITNEY AIRCRAFT AND UNITED TECHNOLOGIES RESEARCH CENTER. THE APPROACH WOULD USE A STATE-OF-THE-ART THREE-DIMENSIONAL NAVIER-STOKES COMPUTER CODE TO ASSESS CANDIDATE VORTEX GENERATOR DESIGNS AND CHOOSE THOSE DEEMED MOST PROMISING FOR EXPERIMENTAL TESTING. UNDER THE PHASE I EFFORT THE ABILITY OF THE NAVIER-STOKES CODE TO SIMULATE THE THREE- DIMENSIONAL PATTERN

RESULTING FROM THE VORTEX GENERATOR WOULD BE CONFIRMED VIA COMPARISON OF COMPUTED RESULTS WITH EXPERIMENTAL DATA. PHSE II WOULD ASSESS CNDIDATE DESIGNS, CHOOSE SPECIFIC GENERATOR GEOMETRIES AND CONFIRM THE SEPARATION SUPPRESSION CHARACTERISTICS OF THE VORTEX GENERATORS THROUGH AN EXPERIMENTAL TEST PROGRAM. FINALLY, THE NAVIER-STOKES AND EXPERIMENTAL RESULTS WOULD BE USED TO INCORPORATE A MODEL INCLUDING THE EFFECTS OF VORTEX GENERATORS WITHIN AN EXISTING DESIGN CODE.

CFD RESEARCH CORP
3325-D TRIANA BLVD
HUNTSVILLE, AL 35805
Program Manager: CLIFFORD E SMITH
Contract #:
Title: FUEL ATOMIZATION ANALYSIS FOR ADVANCED GAS TURBINE COMBUSTORS
Topic #: N90-272 Office: NAPC ID #: 41019

CURRENT STATE-OF-THE-ART CFD SPRAY COMBUSTION CODES DO NOT MODEL THE ATOMIZATION PROCESS, AND USE EMPIRICALLY/ARBITRARILY PRESCRIBED DROPLET CHARACTERISTICS AT THE FUEL INJECTOR EXIT. THIS CRITICAL SHORTCOMING IMPEDS THE ANALYSIS OF IMPORTANT ASPECTS OF GAS TURBINE COMBUSTION. IN PHASE I OF THIS PROJECT, A COMPUTATIONAL MODEL OF THE ATOMIZATION PROCESS WILL BE DEVELOPED FROM FUNDAMENTAL PRINCIPLES, USING FILM DYNAMICS AND SURFACE WAVE INSTABILITY FORMULATIONS. THE COMPLETE PRIMARY BREAKUP PROCESS WILL BE MODELED, INCLUDING FILM STRETCHING, FORMATION OF CIRCUMFERENTIAL RIBBONS AND LIGAMENTS, AND DISTINGRATION OF LIGAMENTS INTO DROPLETS. SUCH AN INNOVATIVE APPROACH WILL ALLOW THE ACCURATE PREDICTION OF DROP SIZE AND DROP VELOCITY DISTRIBUTIONS FROM AIRBLAST AND PRESSURE FUEL INJECTORS. IN PHASE II, THE ATOMIZATION MODEL WILL BE ENHANCED TO INCLUDE SECONDARY ATOMIZATION, VAPORIZATION AND COMBUSTION, AND THEN COUPLED TO AN EXISTING CFD EULERIAN-LAGRANGIAN SPRAY COMBUSTION CODE. EXTENSIVE VERIFICATION AND VALIDATION STUDIES WILL BE PERFORMED, CULMINATING IN THE COMPARISON OF LEAN BLOWOUT WITH EXPERIMENTAL MEASUREMENTS.

METRO-LASER
18006 SKYPARK CIR - #108
IRVINE, CA 92714
Program Manager: DR CECIL F HESS
Contract #:
Title: FUEL AUTOMATION AN INNOVATIVE SIMULATION
Topic #: N90-272 Office: NAPC ID #: 41209

THE PROPOSED WORK CONSISTS OF THEORETICAL AND EXPERIMENTAL INVESTIGATIONS TO DEVELOP A FUEL ATOMIZATION CODE WHICH TRACKS THE BEHAVIOR OF THE FUEL FROM THE INJECTION ELEMENT TO ITS TOTAL EVAPORATION AND COMBUSTION.

METRO-LASER
18006 SKYPARK CIR - #108
IRVINE, CA 0176
Program Manager: DR CECIL F HESS
Contract #:
Title: FUEL ATOMIZATION AN INNOVATIVE SIMULATION
Topic #: N90-272 Office: NAPC ID #: 43070

THE PROPOSED WORK CONSISTS OF A THEORETICAL AND EXPERIMENTAL INVESTIGATION TO DEVELOP A FUEL ATOMIZATION CODE WHICH TRACKS THE BEHAVIOR OF THE FUEL FROM THE INJECTION ELEMENT

TO ITS TOTAL EVAPORATION AND COMBUSTION. THE PROPOSED ATOMIZATION METHOD USES AN INNOVATIVE VORTEX DYNAMICS ALGORITHM WHICH BASED ON FUNDAMENTAL PRINCIPLES WILL ALLOW DISTURBANCES TO GROW AND BREAK INTO LIGAMENTS, AND ULTIMATELY INTO TRANSITIONAL LIUQID ELEMENTS AND DROPLETS. A STATE-OF-THE-ART TRANSIENT DROPLET VAPORIZATION MODEL WILL BE USED TO PREDICT THE GASIFICATION OF THE FUEL. THE MODEL SOLVES THE GOVERNING GAS-PHASE EQUATIONS, INCLUDING SOURCE TERMS FOR VAPORIZATION AND COMBUSTION, BY MEANS OF FINITE DIFFERENCES. HOLOGRAPHY WILL BE EMPLOYED TO EXPERIMENTALLY QUANTIFY THE NATURE AND GROWTH RATE OF THE DISTURBANCES, THE DISTRIBUTION OF LIQUID ELEMENTS, THE EVAPORATION RATE, AND THE COMBUSTION REGION OF SPRAYS RELEVANT TO GAS TURBINE COMBUSTORS. THIS WORK, IF CARRIED THROUGH PHASE II WILL RESULT IN AN ADVANCED FUEL ATOMIZATION AND COMBUSTION CODE FOR GAS TURBINE COMBUSTORS.

OSBORNE A ASSOCS INC
756 LAKEFIELD RD - BLDG J
WESTLAKE VILLAGE, CA 91361
Program Manager: H W VOLBERG
Contract #: N66001-90-C-7031
Title: SENSOR FOR THE DETECTION OF BURIED CABLE FROM A REMOTE TETHERED SUBMERSIBLE
Topic #: N90-273 Office: NOSC ID #: 43077

THE PRIMARY OBJECTIVE OF THIS RESEARCH PROJECT IS TO DEVELOP A SMALL, LIGHTWEIGHT SENSOR TO BE MOUNTED ON AN UNDERWATER REMOTELY OPERATED VEHICLE (ROV) WHICH WILL ALLOW THE OPERATOR TO DETERMINE THE DEPTH OF BURIAL OF AN UNDERWATER CABLE. PHASE I WILL INVESTIGATE ALTERNATE APPROACHES TO ACCOMPLISH THE OBJECTIVE, WILL SELECT THE DESIRED APPROACH AND WILL DEVELOP A PRELIMINARY DESIGN. TO ACCOMPLISH THIS TASK, THREE MAJOR AREAS OF EFFORT HAVE BEEN IDENTIFIED. THE FIRST AREA INCLUDES PROGRAM INITIALIZATION WHEREIN THE COLLECTION OF ALL AVAILABLE LITERATURE REGARDING SENSORS OF INTEREST IS REVIEWED AND A COMPARISON MATRIX IS DEVELOPED TO PROVIDE A LOGICAL PROCESS BY WHICH THE SELECTION OF THE DESIRED APPROACH CAN BE MADE. THE SECOND AREA OF EFFORT INVOLVES THE INVESTIAGTION INTO THE ALTERNATIVE APPROACHES WHICH, BY USE OF THE COMPARISON MATRIX, LEADS TO THE SELECTION OF THE DESIRED APPROACH. HAVING ACCOMPLISHED THE SELECTION PROCESS, THE THIRD AREA OF EFFORT INVOLVES THE PRELIMINARY DESIGN, SPECIFICATION AND FINAL REPORT TASKS.

XINOTECH RESEARCH
1313 FIFTH ST SE - STE 213
MINNEAPOLIS, MN 55414
Program Manager: ROMEL RIVERA
Contract #:
Title: THE XINOTECH PROGRAMMING ENVIRONMENT FOR THE REUSABILITY OF ADA SOFTWARE
Topic #: N90-274 Office: NOSC ID #: 41020

XINOTECH HAS RESEARCH AND DEVELOPED TECHNOLOGY FOR A LANGUAGE-BASED, LANGUAGE-INDEPENDENT, GRAMMAR-GENERATED INTERACTIVE PROGRAMMING ENVIRONMENT. THIS TECHNOLOGY IS COMMERCIALLY AVAILABLE FOR ADA, CMS-2, PDLs AND OTHER LANGUAGES. THE OBJECTIVE OF THE PROPOSED RESEARCH IS TO USE THIS TECHNOLOGY AS A FRAMEWORK TO MAXIMIZE THE REUSE OF ADA SOFTWARE. THE NEW ENVIRONMENT WILL 1) ASSIST IN THE UNDERSTANDING OF ADA PROGRAMS, 2) PROVIDE A METHODOLOGY CONDUCTIVE TO REUSE, 3) PREDICT THE REUSABILITY EFFORT, AND 4) AUTOMATE ASPECTS OF THE REORGANIZATION, MODULARIZATION AND MODIFICATION OF ADA SOFTWARE. (1) WILL PRODUCE THE GRAPH ANALYZER TO DISPLAY ADA OBJECT RELATION- SHIPS, A DICTIONARY AND LIBRARY BROWSER FOR FAST CROSS-REFERENCING AND RETRIEVAL, AN OUTLINER FOR GENERATING CUSTOMIZED OUTLINES, AND AN ADA DOCUMENTATION ABSTRACTOR. (3) WILL PRODUCE THE GUIDELINE AND MATRICS ANALYZER TO PREDICT REUSABILITY AND AUTOMATE CONVERSION OF ADA SOFTWARE TO STANDARDS. (4) WILL PRODUCE THE GLOBAL RESTRUCTURER TO "SPLIT OFF" COMPONENTS

FROM EXISTING SYSTEMS, THE LOCAL RESTRUCTURER TO INCREASE READABILITY AND MAINTAINABILITY, AND THE LIBRARY REUSE ADAPTER, TO AUTOMATE THE PORTING OF EXISTING SYSTEMS ACROSS DIFFERENT SUPPORT LIBRARIES. THESE TOOLS WILL BE OPEN SYSTEMS WITH IMMEDIATE COMMERCIAL AVAILABILITY. (2) WILL COMBINE THESE TOOLS WITH OTHERS TO PRODUCE MULTI-PLATFORM APSE'S SUPPORTING THE LEADING METHODOLOGIES.

DEFENSE SYSTEMS INC
1521 WESTBRANCH DR
McLEAN, VA 22102
Program Manager: ROBERT A SUMMERS
Contract #:
Title: MINIATURIZED RADIO RELAY FOR UHF/VHF COMMUNICATIONS
Topic #: N90-275 Office: NOSC ID #: 41021

RADIO RELAYS INSTALLED ON ELEVATED PLATFORMS SUCH AS KITES AND BALLOONS CAN EXTEND LINE-OF-SIGHT VHF AND UHF COMMUNICATIOS RANGE BEYOND THE HORIZON. THESE RELAYS MUST BE LIGHTWEIGHT, OPERATE FOR SEVERAL HOURS ON SELF-CONTAINED BATTERIES, AND, BECAUSE THEY ARE EXPENDABLE ITEMS, BE LOW COST. A REPEATER WILL BE DEVELOPED USING CURRENT LOW-COST TECHNOLOGY THAT WILL SIMULTANEOUSLY REPEAT THREE COMMUNICATION CHANNELS, TWO 25 kHz AM VOICE AND ONE 25 kHz FM DATA CHANNEL. THE REPEATER USES AN IF REPEATER ARCHITECTURE, WITH THREE INDEPENDENT CHANNELS, EACH FREQUENCY SELECTED BY A PROGRAMMABLE SYNTHESIZER. THE THREE CHANNELS ARE TRANSLATED BY A CONSTANT FREQUENCY SHIFT, AND SUMMED TOGETHER. THE COMPOSITE SIGNAL IS AMPLIFIED BY A LINEAR AMPLIFIER TO 5 WATTS PER CHANNEL AND RETRANSMITTED. A DIPLEXER SEPARATES THE RECEIVE AND TRANSMIT BANDS TO ALLOW A COMMON ANTENNA. THE REPEATER WILL OPERATE FOR 12 HOURS WITH 50% DUTY CYCLE. THE REPEATER USES RECENTLY DEVELOPED LOW-POWER RF AND IF INTEGRATED CIRCUITS, HIGH ENERGY BATTERIES, AND LOW COST MINIATURE PACKAGING TECHNIQUES TO PROVIDE THE ENTIRE ELECTRONICS WITH BATTERIES IN A SIX POUND PACKAGE SUITABLE FOR BALLOONS. THE DEVELOPMENT WILL PROVIDE A SYSTEM ARCHITECTURE AND BUILDING BLOCK MODULE DESIGNS SUITABLE FOR REPEATERS OPERATING IN THE VHF AND UHF FREQUENCY BANDS. THE IF REPEATERS ARE NOT LIMITED TO SPECIFIC MODULATION FORMATS AND CAN BE ADAPTED TO MOST NARROWBAND SIGNALS.

CHU ASSOCS INC
800 FESLER ST
EL CAJON, CA 92020
Program Manager: DR STEVEN R BEST
Contract #:
Title: MULTI-FUNCTION SHIPBOARD ANTENNAS
Topic #: N90-276 Office: NOSC ID #: 41022

THE NAVY BATTLE GROUP RELIES ON THE SUCCESSFUL FUNCTIONING OF ANTENNA SYSTEMS TO MEET MISSION REQUIREMENTS. NUMEROUS ANTENNAS ARE ALL COMPETING FOR A PORTION OF THE RF SPECTRUM AND FOR A CLEAR FIELD OF VIEW. TOPSIDE SPACE TO ALLOW UNDEGRADED OPERATION OF THE ANTENNA SYSTEMS IS NOT AVAILABLE ON ANY NAVY SHIP. A REDUCTION IN THE QUANTITY OF INDIVIDUAL ANTENNAS WITHOUT REDUCING THE QUALITY OF THE SERVICE PROVIDED IS NEEDED. CHU ASSOCIATES, INC. PROPOSES TO DEVELOP NOVEL INNOVATIVE ANTENNA TECHNIQUES AND DESIGN APPROACHES TO REDUCE THE QUANTITY OF ANTENNAS, IMPROVE PERFORMANCE CHARACTERISTICS LESSEN SYSTEM INTERACTION, AND IMPROVE SURVIVABILITY AND RELIABILITY.

ASTRON CORP
470 SPRING PARK PL - #100
HERNDON, VA 22070

Program Manager: JOSEPH R JAHODA
Contract #:
Title: MINIATURIZED RF COMPONENTS
Topic #: N90-278 Office: NOSC ID #: 41023

ALL RF SYSTEMS HAVE UNDERGONE TREMENDOUS MINIATURIZATION DURING THE LAST FEW DECADES. HOWEVER, THE SIZE OF RF COMPONENTS, SUCH AS DUPLEXERS, FILTERS, MOLATORS HAVE UNDERGONE VERY LITTLE; WHILE THE ANTENNAS HAVE UNDERGONE VIRTUALLY NONE. THROUGH THE USE OF ASTRON'S NEWLY DEVELOPED DIELECTRIC/FERRITE ANTENNA LOADING TECHNIQUES AND RECENT ADVANCES IN SUPERCONDUCTIVITY, THERE IS NOW THE POSSIBILITY OF ACHIEVING OVER 50% ANTENNA MINIATURIZATION AT LITTLE LOSS IN EFFICIENCY.

ASTRON CORP
470 SPRING PARK PL - #100
HERNDON, VA 22070
Program Manager: JOSEPH R JAHODA
Contract #:
Title: SMALL SHIP HF ANTENNAS
Topic #: N90-282 Office: NOSC ID #: 41024

AN INNOVATIVE DIELECTRICALLY LOADED MINIATURE UHF SATCOM ANTENNA IS PROPOSED FOR A FOLLOW-ON UHF SATCOM ANTENNA SYSTEM WHICH IS COMPATIBLE WITH SMALL SHIPS (DDG-51, PHM, MCM, ETC.). THE NEW ANTENNA WILL HAVE THE POTENTIAL CAPABILITY TO BE RETROFITTED ON EXISTING PLATFORMS AND THE PERFORMANCE CHARACTERISTICS NECESSARY TO COMMUNICATE VIA DAMA.

SCIENTIFIC COMPUTING ASSOCS INC
246 CHURCH ST - STE 307
NEW HAVEN, CT 06510
Program Manager: DR DAVID FOULSER
Contract #:
Title: RESEARCH AND DEVELOPMENT OF A PORTABLE PARALLEL LIBRARY OF BASIC LINEAR ALGEBRA SUBPROGRAMS
Topic #: N90-286 Office: NOSC ID #: 41025

WE PROPOSE TO DEVELOP A PORTABLE, PARALLEL LIBRARY OF HIGH-LEVEL BASIC LINEAR ALGEBRAIC SUBPROGRAMS FOR USE BY THE NATIONAL SCIENTIFIC COMMUNITY. SUCH A PORTABLE PARLLEL LIBRARY OF ROUTINES WILL AID GREATLY IN THE DISSEMINATION AND WIDESPREAD USE OF ADVANCED LINEAR ALGEBRA ALGORITHMS ON A VARIETY OF PARALLEL COMPUTERS AND COMPUTER NETWORKS. SUCH ALGORITHMS OFTEN FORM THE COMPUTER-INTENSIVE KERNELS OF LARGE COMPUTATIONS. THE BENEFITS OF OUR EFFORT INCLUDE: 1) OBVIATING THE NEED FOR SEPARATE DEVELOPMENT EFFORTS OF PARALLEL BLAS ROUTINES FOR EACH PARALLEL COMPUTER VENDOR, 2) HARNESSING VAST AMOUNTS OF UNTAPPED PARALLEL NETWORK COMPUTING CYCLES (BY USING NETWORK NODES WHEN THEY ARE NOT BEING USED), AND 3) DEVELOPING PARALLEL PROGRAMMING METHODOLOGY TO USE AS THE BASIS FOR OTHER PORTABLE PARALLEL SUBROUTINE LIBRARIES. THIS EFFORT WILL COMPLEMENT THE EFFORTS OF OTHER RESEARCH GROUPS TOWARD LINEAR ALGEBRA ALGORITHM DEVELOPMENT. THE EFFORT WILL INCLUDE A MACHINE-INDEPENDENT PARALLEL IMPLEMENTATION OF THE LEVEL 3 BLAS, AS WELL AS ALGORITHMIC AND PROGRAM MODIFICATIONS OF THE LAPACK PROGRAMS TO ALLOW IT TO OPERATE IN PARALLEL IN A MACHINE-INDEPENDENT MANNER. THE DEVELOPMENT EFFORT WILL BE BASED ON THE LINDA PARALLEL COMPUTING CONSTRUCT, WHICH AUGMENTS THE C PROGRAMMING LANGUAGE TO PROVIDE A UNIFORM, MACHINE- INDEPENDENT PARALLEL PROGRAMMING LANGUAGE.

REKENTHALER TECHNOLOGY ASSOCS CORP
3400 JENNINGS CHAPEL RD
WOODBINE, MD 21797
Program Manager: DR WILLIAM W TAYLOR
Contract #:
Title: ADAPTIVE DIVERSITY RECEPTION AT HF
Topic #: N90-289 Office: NOSC ID #: 41026

HF SIGNAL FADING FREQUENTLY RESULTS FROM MUTUALLY INTERFERING MULTIPATH SIGNAL EFFECTS CAUSED BY GROUND OR OCEAN REFLECTION OF THE ELECTROMAGNETIC WAVES ALONG DIVERSE PROPAGATION PATHS. THIS PHASE I SBIR PROGRAM EXPLOITS INNOVATIVE NONLINEAR DYNAMICAL (NDL) SIGNAL PROCESSING METHODOLOGIES TO MODEL, PREDICT AND MINIMIZE THE UNDERLYING ELECTRODYNAMIC SYSTEM PROCESSES, THEREBY REDUCING BACKGROUND NOISE AND DISCRIMINATING THE DESIRED HF SIGNAL.

ORINCON CORP
970 N KALAHEO AVE - #C215
KAILUA, HI 96734
Program Manager: GERALD C MOONS
Contract #:
Title: NATURAL OPERATOR INPUT TECHNIQUES FOR UNDERSEA SURVEILLANCE SYSTEMS
Topic #: N90-290 Office: NOSC ID #: 41027

THE NAVY HAS A CONTINUING NEED FOR IMPROVED COMPUTER-INTERFACE DESIGNS THAT SIMPLIFY OPERATOR TASKS AND REDUCE TRAINING REQUIREMENTS FOR SUPPORTING THE OPERATION OF ADVANCED COMPUTER-BASED DISPLAY SYSTEMS. RECENTLY, PROGRESS HAS BEEN MADE IN NON-MILITARY APPLICATIONS OF TOUCH SENSITIVITY SCREENS AND DIGITAL GRAPHICS TABLET SYSTEMS. SUCH SYSTEMS OPTIMIZE THE USE OF NATURAL OPERATOR GESTURES AND WRITING SKILLS TO ENTER INFORMATION INTO AND CONTROL COMPUTER-BASED SYSTEMS. THE PURPOSE OF THIS PROJECT IS TO DEVELOP APPLICATIONS FOR OPERATOR-MACHINE INPUT DEVICES SPECIFICALLY DESIGNED TO SIMPLIFY TASKS AND REDUCE THE TRAINING REQUIREMENTS FOR THE OPERATION OF COMPLEX UNDERSEA SURVEILLANCE SYSTEM EQUIPMENT. UNDER THE FIRST TASK, A TECHNOLOGY ASSESSMENT OF GRAPHICS TABLET AND TOUCH SCREEN SYSTEMS WILL BE CONDUCTED. THIS WILL BE FOLLOWED BY DESIGN OF OPERATOR INPUT TECHNIQUES THAT EXPLOIT THESE STATE-OF-THE-ART TECHNOLOGIES FOR MANIPULATION OF COMPUTER SYSTEM COMMANDS, MANUAL ANNOTATION OF LOFAR GRAMS, AND MANUAL IDENTIFICATION OF SIGNATURE FEATURES. UNDER THE THIRD AND FINAL TASK, ORINCON WILL DEMONSTRATE AND EVALUATE THE UTILITY OF THESE INPUT DEVICES AND TECHNIQUES.

SOFTWARE PRODUCTIVITY SOLUTIONS INC
122 N 4TH AVE
INDIALANTIC, FL 32903
Program Manager: J KAYE GRAU
Contract #: N66001-90-C-2040
Title: C2D2: A COMMAND AND CONTROL DOMAIN-DIRECTED REUSE LIBRARY SYSTEM
Topic #: N90-291 Office: NOSC ID #: 41212

THIS PHASE I SBIR PROPOSES AN INNOVATIVE, DOMAIN-DIRECTED SOFTWARE REUSE PROCESS SUPPORTED BY AN AUTOMATED DOMAIN-SPECIFIC COMPONENT RETRIEVAL SYSTEM--C2D2, A COMMAND AND CONTROL, DOMAIN-DIRECTED REUSE LIBRARY SYSTEM. C2D2 WILL PROVIDE COMMAND AND CONTROL SOFTWARE ENGINEERS THE SAME BENEFITS THAT HARDWARE ENGINEERS HAVE TODAY--A ROBUST SET OF USABLE COMPONENTS AND AUTOMATED SUPPORT FOR IDENTIFYING, SELECTING AND SYNTHESIZING THESE COMPONENTS. THE PHASE I EFFORT WILL RESULT IN THE FOLLOWING: COMMAND AND CONTROL (C2) DOMAIN STUDY; DOMAIN-DIRECTED REUSE PROCESS MODEL AND OPERATIONAL CONCEPT; C2D2

PRODUCT SPECIFICATION. C2D2 WILL PROVIDE THE ENGINEER WITH A USER- FRIENDLY GRAPHIC INTERFACE FOR NAVIGATING AND SEARCHING C2 DOMAIN TAXONOMIES, DOMAIN MODELS, GENERIC ARCHITECTURES AND OTHER REPRESENTATIONS. THE DOMAIN-SPECIFIC USER INTERFACE, USING MODELS AND ARCHITECTURES, WILL ENCOURAGE EARLY, LARGE-SCALE REUSE, THEREBY MAXIMIZING THE BENEFITS OF REUSE. C2D2 WOULD BE POPULATED WITH C2 DOMAIN ANALYSIS WORK PRODUCTS AND COMPONENTS.

IRI CORP
4544 TOTANA DR
TARZANA, CA 91356
Program Manager: DR IZHAK RUBIN
Contract #:
Title: SAFENET AND FDDI PERFORMANCE EVALUATION TOOL
Topic #: N90-292 Office: NOSC ID #: 41028

THE PURPOSE OF OUR PROPOSED WORK IS TO USE THE ANALYTICAL INNOVATIVE TECHNIQUES WE HAVE BEEN DEVELOPING TO DEVELOP IN PHASE I EFFICIENT ANALYTICAL METHODS THAT CAN THEN BE USED IN PHSE II FOR THE DEVELOPMENT OF A SOFTWARE TOOL CONDUCTING PERFORMANCE EVALUATION FOR SAFENET II AND FDDI LOCAL AREA NETWORKS. OUR PROPOSED TOOL ENCOMPASSES THE KEY DELAY-THROUGHPUT PERFORMANCE MECHANISMS INVOLVED IN THE END-TO-END COMMUNICATIONS PROCESS. DETAILED PERFORMANCE ANALYSIS PROCEDURES ARE FIRST DEVELOPED TO COMPUTE AVERAGE, MAXIMUM AND VARIANCE LEVELS FOR MESSAGE DELAY, BUFFER-SIZES AND THROUGHPUT INDICES FOR THE MEDIUM ACCESS-CONTROL LAYER, WHICH UTILIZES THE FDDI TIMED TOKEN ROTATION PROTOCOL. SYNCHRONOUS AND MULTI-PRIORITY ASYNCHRONOUS MESSAGE CLASSES ARE CONSIDERED, UNDER A MULTITUDE OF TRAFFIC AND SYSTEM CONFIGURATION CONDITIONS. PURE ANALYTICAL AND JOINT ANALYTIC/NUMBERIC APPROACHES ARE DEVELOPED. A DETAILED SIMULATION MODEL RECENTLY DEVELOPED AT IRI IS USED TO VERIFY AND CALIBRATE THE ANALYTICAL SCHEMES. IN ADDITION, QUEUEING MODELS ARE INTRODUCED, IN A LAYERED FASHION, TO ACCOUNT FOR MESSAGE DELAYS THAT OCCUR AT THE LLC AND TRANSPORT LAYERS, INCLUDING COMPONENTS INDUCED BY MULTIPLEXING, ERROR CONTROL AND FLOW CONTROL SCHEMES EMPLOYED BY TP-4 OR XTP TRNSPORT PROTOCOLS, AS WELL AS FOR COMPONENTS INTRODUCED BY PROCESSING DELAYS AT THE USER AND APPLICATION LAYERS.

AMERASIA TECHNOLOGY INC
620-1 HAMPSHIRE RD
WESTLAKE VILLAGE, CA 91361
Program Manager: DR EDWARD J STAPLES
Contract #:
Title: AN AIRBORNE REAL TIME RESPONSE MONITOR
Topic #: N90-293 Office: NOSC ID #: 41030

THIS PROPOSAL ADDRESSES THE NEED FOR ADVANCED SIGNAL PROCESSING IN AIRBORNE SURVEILLANCE AND TARGETING RECEIVERS. AN INNOVATIVE REAL TIME COMPRESSIVE RECEIVER ARCHITECTURE USING SURFACE ACOUSTIC WAVE (SAW) TRANSFORMERS IS PROPOSED AS AN ADAPTIVE AIRBORNE RESPONSE MONITOR SYSTEM. PRELIMINARY INVESTIGATION INDICATES THE PROPOSED AIRBORNE RESPONSE MONITOR WOULD BE ABLE TO PROVIDE SIMULTANEOUS TIME AND FREQUENCY DOMAIN ANALYSES IN REAL TIME WITH 100% PROBABILITY OF INTERCEPT. THE SYSTEM WOULD ALSO SATISFY SIZE, WEIGHT, PHASE COHERENCY, AND PROGRAMMABILITY REQUIREMENTS. THE ABILITY TO MONITOR AND PROCESS SOPHISTICATED SIGNAL FORMATS MAKES THE PROPOSED SYSTEM IDEALLY SUITED TO IDENTIFICATION OF VIRTUALLY ANY TYPE OF RADAR EMITTER. IN PHASE I, A DESIGN ANALYSIS OF THE PROPOSED RESPONSE MONITOR SYSTEM WILL ADDRESS SYSTEM REQUIREMENTS SUCH AS INSTANTANEOUS BANDWIDTH, RESOLUTION, AND DYNAMIC RANGE. SIMULATION STUDIES USING DESIGN MODELS FOR CRITICAL HARDWARE FUNCTIONS WILL IDENTIFY PROJECTED PERFORMANCE AND SIMULATED ACTUAL

EW ENVIRONMENTS.

MENLO INDUSTRIES INC
44060 OLD WARM SPRINGS BLVD
FREMONT, CA 94538
Program Manager: DR MICHAEL H YAM
Contract #:
Title: MINIATURE HIGH EFFICIENCY CHANNELIZED RECEIVERS
Topic #: N90-293 Office: NOSC ID #: 41029

THIS PROJECT SEEKS TO DEMONSTRATE A STATE OF THE ART WIDEBAND CHANNELIZED RECEIVER FRONT END, USING NEWLY DEVELOPED GaAs MMIC TECHNOLOGY. BROADBAND CHANNELIZED RECEIVERS ARE NEEDED FOR HIGH PROBABILITY OF INTERCEPT IN THE INCREASINGLY DENSE EW ENVIRONMENT. THEY ARE NOT WIDELY USED DUE TO DEFICIENCIES IN SIZE, WEIGHT, DC CONSUMPTION AND COST. USING NEWLY DEVELOPED SUCCESSIVE DETECTION LOG VIDEO AMPLIFIERS AND LUMPED ELEMENT FILTERS IN MMIC FORM, ORDER OF MAGNITUDE IMPROVEMENT ON THE LISTED DEFICIENCIES WILL BE DEMONSTRATED. AN EXAMPLE IS A 0.5-18 GHz TEN CHANNEL RECEIVER WITH 60 dB DYNAMIC RANGE CONSUMING LESS THAN 10 WATTS, WHILE OCCUPING 3x3x1 INCHES. A FINE RESOLUTION RECEIVER FOR SECOND CHANNELIZATION IS ALSO PROPOSED. AN ADDED BENEFIT IS THE VERY HIGH SPEED ACHIEVABLE. RADAR PULSES DOWN TO 20 nsec MAY BE DETECTED WITH NEGLIGIBLE SHADOW TIME.

COLEMAN RESEARCH CORP
5950 LAKEHURST DR
ORLANDO, FL 32819
Program Manager: JOEL GREENSTEIN
Contract #: N6601-91-C-7005
Title: A TETHERED FLOATING FIBER OPTIC PERISCOPE FOR SUBMARINES
Topic #: N90-296 Office: NOSC ID #: 43241

A REMOTE PERISCOPE IS PROPOSED THAT CAN BE DEPLOYED FROM A SUBMARINE. THE DEVICE REPLICATES THE FUNCTIONS OF A CONVENTIONAL PERISCOPE WHILE MAINTAINING ITS UNIQUE FEATURES. PRELIMINARY REQUIREMENTS ON THE NEW DEVICE HAVE BEEN SET. THE DEVICE SHOULD RISE TO ABOUT 4 m ABOVE THE WATERLINE FOR VIEWING OVER WAVES. THE RANGE SHOULD BE GREATER THAN 10 km. THE PERFORMANCE AT RANGE SHOULD BE SUFFICIENT TO DETECT AND RECOGNIZE SMALL OBJECTS. THE PERISCOPE SHOULD HAVE A +60 TO -5 DEG FIELD OF REGARD IN ELEVATION AND 360 DEG IN AZIMUTH. A MAXIMUM POSSIBLE FIELD-OF-VIEW (FOV) IS DESIRABLE. DIRECT OPTICS FOVs ARE OPTIMISTIC GOALS FOR IMAGING DEVICES. THE OPTICAL ELEMENT DIAMETER, d, HAS DIRECT BEARING ON THE PERFORMANCE. THE LARGER d, THE LARGER EFFECTIVE RANGE. HOWEVER, OBSERVABILITY, SIZE, AND COST OF THE PACKAGE ALSO GROW WITHd. AFTER RELEASE FROM A STORAGE TRUNK, THE DEVICE (PROPORTIONED LIKE A TORPEDO) SWIMS TO A REMOTE STATION JUST UNDER THE SURFACE, FAR FROM THE SUBMARINE. HERE, THE AFT PORTION IS FLOODED, CAUSING A ROTATION TO VERTICAL. THE FORWARD PART IS THEN RAISED IN A MANNER SIMILAR TO THAT OF A CONVENTIONAL PERISCOPE. TWO STABILIZATION SYSTEMS WILL BE USED. THE FIRST (COARSE) SYSTEM WILL KEEP THE DEVICE VERTICAL AND WILL HOLD STATION AGAINST SURFACE SURRENTS. THE FINE SYSTEM WILL STABILIZE THE LINE-OF-SIGHT (LOS) TO A TARGET BY MOVING A MIRROR IN THE PERISCOPE HEAD. THE FINE SYSTEM WILL MOVE THE MIRROR IN PITCH AND YAW. ROLL ABOUT THE LOS WILL BE STABILIZED ELECTRONICALLY.

OSBORNE ASSOCIATES INC
756 LAKEFIELD RD - BLDG J
WESTLAKE VILLAGE, CA 91361

Program Manager: ANDREW BAZELEY
Contract #: N66001-91-C-7006
Title: A TEHTERED FLOATING FIBER OPTIC PERISCOPE FOR SUBMARINES
Topic #: N90-296 Office: NOSC ID #: 43247

THE PHASE I PROJECT WILL DEVELOP THE TECHNICAL SPECIFICATION FOR A FIBER OPTIC REMOTE SURFACE SENSOR PLATFORM SYSTEM (FORSSEPS) THAT CAN BE DEPLOYED FROM A SUBMERGED SUBMARINE AND WHICH CAN BE REMOTELY DIRECTED TO THE SURFACE OF THE OCEAN TO GATHER VISUAL AND RF INFORMATION WHILE MINIMIZING RISK EXPOSURE IN A VARIETY OF TACTICAL AND OPERATIONAL SITUATIONS. THE PREEMINENT DESIGN CRITERIA FOR THE FORSSEPS VEHICLE AND SENSOR PLATFORM WILL BE THAT IT PROVIDE SUFFICIENT STABILITY THAT EFFECTIVE 360 DEGREE IMAGING CAN BE ACCOMPLISHED WITH LOW RISK OF DETECTION. IN ADDITION, THE FORSSEPS VEHICLE MAY BE EQUIPPED WITH VARIOUS RF AND OPTICAL APERTURE SENSORS, THEREBY ENABLING COMMUNICATIONS LINKS WITH SATELLITES, ELINT, ETC. THROUGH USE OF A FIBER OPTIC LINK AND BY PROVIDING THE VEHICLE WITH ON-BOARD PROPULSION, STANDOFF RANGES OF SEVERAL KILOMETERS CAN EASILY BE ACHIEVED FROM THE PARENT SUBMARINE. ALTERNATELY, BE EQUIPPING THE FORSSEPS VEHICLE AS A HYDRODYNAMIC LIFTING BODY THAT CAN BE TOWED TO THE SURFACE, SURVEILLANCE MISSIONS CAN BE CONDUCTED WHILE THE PARENT SUBMARINE IS UNDERWAY. THE SPECIFICATION DEVELOPED WILL ADDRESS THE PROPOSED FORSSEPS VEHICLE DESIGN, THE STABILIZED SENSOR PLATFORM, THE IMAGING SYSTEM, THE FIBER OPTIC DATA LINK, NAVIGATION SENSORS, THE LAUNCH AND RECOVERY SYSTEM AND THE OPERATORS CONTROL STATION.

PACIFIC RIM ENGINEERING
7932 W 79TH ST
PLAYA DEL REY, CA 90293
Program Manager: HARRY NELSON
Contract #: N66001-91-C-7004
Title: A TETHERED FLOATING FIBER OPTIC PERISCOPE FOR SUBMARINES
Topic #: N90-296 Office: NOSC ID #: 43248

THE PURPOSE OF THIS PHASE I STUDY IS TO DETERMINE THE FEASIBILITY OF A REMOTE IMAGING AND TRACKING PERISCOPE THAT CAN BE FREE FLOATING, BUT TETHERED TO A SUBMARINE. THE FLOATING PERISCOPE CONTAINS A TWO- AXIS STABILIZED LINE OF SIGHT FOR VARIOUS IMAGING VISIBLE AND INFRARED CAMERA SYSTEMS THAT PROVIDE VIDEO DATA VIA A FIBER-OPTIC DATA LINK TO A REMOTE SUBMERGED SUBMARINE. THE PERISCOPE TO BE FEASIBLE AND ECONOMICAL USES VARIOUS DEVICES, I.E., IR AND VISIBLE CAMERAS, STABILIZATION SYSTEMS, AND TRACKERS, AND POWER SUPPLIED, THAT ARE ALREADY IN THE DoD INVENTORY. COMBINING THESE EXISTING DEVICES AND ELECTRONICS ALONG WITH AN EXISTING FIBER-OPTIC DATA LINK (ARMY FOG-M MISSILE) INTO A UNIQUE PERISCOPE SYSTEM AND SPECIFYING THE SYSTEMS DESIGN REQUIREMENTS FORMS THE PHASE I REPORT.

ADVANCED MATERIAL SYSTEMS INC
230 WEST HALL - STE 201
SLIDELL, LA 70460
Program Manager: MATTHEW T LIU
Contract #:
Title: MARINE PAINTS WITH ICEPHOBIC PROPERTIES
Topic #: N90-298 Office: DTRC ID #: 41252

ICE PHOBIC COATING MATERIAL, CURRENTLY USED BY THE U.S. NAVY SURFACE SHIPS OPERATING IN ARCTIC REGIONS AND NORTH AATLANTIC, IS ENVIRONMENTALLY UNSTABLE, PRASITIC, AND SACRIFICIAL IN NATURE. THIS PAPER PRESENTS A TECHNICAL APPROACH IN THE DEVELOPMENT OF A DIFFERENT TYPE OF TOP COAT/PAINT THAT IS ENVIRONMENTALLY STABLE, MAINTENANCE FREE WITH BUILT-IN RESISTA.‹CE

TO ICE AND FROST ACCERTION OR FORMATION BY MODIFYING CURRENT MARINE PAINT SYSTEMS SPECIFIED PER MILITARY STANDARDS, MIL-P-24441 (SH). THE PAPER DEFINES COATING MATERIAL PROPERTY REQUIREMENTS AND MATERIAL SELECTION CRITERIA. COATING SYSTEM FORMULATION AND PROCESS ARE BEING DISCUSSED. THE PAPER ALSO ADDRESSES PROOF-OF-CONCEPT TESTS AND FUTURE RESEARCH AND DEVELOPMENT EFFORT IN OPTIMIZING THE COATING SYSTEM FROM PERFORMANCE AND COST STAND POINT.

CAPE COD RESEARCH INC
PO BOX 600 - 95 MAIN ST
BUZZARDS BAY, MA 02532
Program Manager: DR BRIAN G DIXON
Contract #:
Title: MARINE ICEPHOBIC PAINTS WITH PASSIVE DYNAMIC CHARACTER
Topic #: N90-298 Office: DTRC ID #: 41253

THE PROPOSED RESEARCH INVESTIGATES THE FEASIBILITY OF DEVELOPING AN INNOVATIVE ICEPHOBIC COATING TYHAT WILL PREVENT THE ACCRETION OF ICE ON ANTENNAS AND COMMUNICATION EQUIPMENT VIA THE PHENOMENA OF PASSIVE DYNAMICS. THE UNDERLYING CONCEPT IS TO INCORPORATE SPECIAL MATERIALS INTO EXISTING ICEPHOBIC COATING FORMULATIONS WHICH, ALTHOUGH PASSIVE UNDER NORMAL CONDITIONS, BECOME DYNAMIC WHEN ICE FORMING CONDITIONS PREVAIL. THIS DYNAMISM WILL PREVENT WATER MOLECULES FROM NUCLEATING AT SPECIFIC SITES, AN ACTION THAT IS REQUIRED FOR ICE TO FORM. THE SUCCESS OF THE RESEARCH PROGRAM WILL RESULT IN A SIGNIFICANT STEP FORWARD IN THE STATE OF THE ART OF SUPPRESSING ICE ACCRETION UPON VARIETY OF DIFFERENT SURFACES, ESPECIALLY ANTENNAS AND COMMUNICATION GEAR WHERE ICE BUILDUP CAN CAUSE SEVERE ATTENTUATION AND LOSS IN PERFORMANCE.

FUZETRON INC
1100-J N MAGNOLIA AVE
EL CAJON, CA 92020
Program Manager: DR THOMAS W OAKES
Contract #:
Title: NOVEL MARINE PAINTS WITH ICE PHOBIC PROPERTIES
Topic #: N90-298 Office: DTRC ID #: 41254

A CONTINUING PROBLEM FACING THE NAVY IS ICE ACCRETION ON SURFACE SHIP ANTENNA SYSTEMS OPERATING IN THE ARCTIC REGIONS AND THE NORTH ATLANTIC. ICE ACCRETION CAN HAVE A SEVERE EFFECT ON THE OPERATIONAL CAPABILITY OF TOP SIDE SYSTEMS INCLUDING ANTENNAS FOR RADAR AND COMMUNICATIONS. COATINGS CURRENTLY IN USE ARE EXPENSIVE, DEGRADE EASILY AND CAN BE DIFFICULT TO APPLY. THE OBJECTIVE OF THE PRESENT EXPLORATORY WORK IS TO REVIEW PERFORMANCE REQUIREMENTS AND GOALS OF INNOVATIVE ICE PHOBIC COATINGS AS WELL AS TO DESIGN AND DEVELOP INITIAL FORMULATION OF NEW MATERIAL COATINGS AND EXPULSION SYSTEMS, CONSTRUCT SAMPLES AND TEST FOR PROOF-OF-CONCEPT FOR THESE MATERIALS. THE PROPOSING COMPANY HAS DONE WORK IN THE DEVELOPMENT OF NON VOC POLYMER MATERIALS FOR CORROSION, ABRASION, CHEMICAL AGENT, QUICK WATER RELEASE AND MECHANICAL FAILURE RESISTANCE FOR NAVY APPLICATIONS AS WELL WORK IN SIGNATURE REDUCTION. INNOVATIVE CORROSION RESIST .NT MATERIALS HAVE BEEN DEVELOPED THROUGH RESEARCH AT FUZETRON THAT SURVIVE IN DIVERSE ENVIRONMENTAL, CHEMICAL, AND ULTRAVIOLET EXPOSURE WHILE DEMONSTRATING ADHESION AND EXCELLENT PERFORMANCE FOR NAVY USE.

MATERIALS SCIENCES CORP
GWYNEDD PLAZA II - BETHLEHEM PIKE
SPRING HOUSE, PA 19477

Program Manager: DR RONALD BUCINELL
Contract #:
Title: COMPOSITE GEARCASES FOR SHIP MAIN PROPULSION GEARS
Topic #: N90-299 Office: DTRC ID #: 41255

INCORPORATION OF CONSTRAINED LAYER DAMPING TECHNIQUES INTO ADVANCED POLYMER AND METAL MATRIX COMPOSITE MATERIALS OFFER NUMEROUS ADVANTAGES FOR REDUCING WEIGHT AND ENHANCING THE VIBRATION AND NOISE DAMPING CHARACTERISTICS OF NAVY GEARCASES. THE SUCCESSFUL INCORPORATION OF THESE MATERIALS INTO THE GEARCASE ENVIRONMENT WILL REQUIRE A THOROUGH DEVELOPMENT PROGRAM. THIS PROGRAM SHOULD INCLUDE RATIONAL ENGINEERING ANALYSES, PROTOTYPE DEVELOPMENT, AND AN EXPERIMENTAL EVALUAUTION OF THE PROTOTYPE. THE PRIMARY OBJECTIVE OF THE PHASE I EFFORT IS TO IDENTIFY THE PARALLEL SHAFT AND EPICYCLIC GEARING CASE COMPONENTS THAT HAVE THE GREATEST INFLUENCE ON GEARCASE WEIGHT, VIBRATION, AND NOISE CHARACTERISTICS. ONCE THESE COMPONENTS ARE IDENTIFIED, ALTERNATIVE DESIGNS USING VARIOUS COMPOSITE MATERIALS AND DAMPING TECHNIQUES WILL BE EVALUATED. THIS EFFORT WILL INCLUDE THE PRELIMINARY MATERIAL DESIGN AND STRUCTURAL ANALYSES, AN ASSESSMENT OF THE EFFECTS OF ENVIRONMENT AND LOADING ON THE EFFICIENCY AND RELIABILITY OF THE COMPONENTS, AND THE INFLUENCE OF THE COMPONENT'S NEW MATERIAL PROPERTIES ON THE INTERCONNECTION WITH THE SHIP STRUCTURE.

NKF ENGINEERING INC
4200 WILSON BLVD - STE 1000
ARLINGTON, VA 22203
Program Manager: PHILIP BOGERT
Contract #:
Title: COMPOSITE GEARCASES FOR SHIP MAIN PROPULSION GEARS
Topic #: N90-299 Office: NSSC ID #: 41256

ANALYTICAL AND TEST PROGRAM TO DETERMINE THE FEASIBILITY OF USING COMPOSITE MATERIALS TO REDUCE WEIGHT AND ENHANCE THE VIBRATION AND NOISE DAMPING CHARACTERISTICS OF NAVY GEARCASES WHILE MAINTAINING STRENGTH AND STIFFNESS REQUIRED TO SUPPORT TORQUE, BEARING AND HIGH IMPACT SHOCK LOADS. PHASE I WILL KEY ON IDENTIFYING THE BEST POLYMER AND METAL MATRIX MATERIALS FROM TRADE-OFF STUDIES OF MANY AVAILABLE MATERIALS, AS WELL AS THE DEVELOPMENT OF ANALYTICAL TECHNIQUES FOR SHOCK, NOISE, AND VIBRATION EVALUATION. TECHNIQUES WILL BE APPLIED TO THREE PRELIMINARY GEARCASE CONCEPTS DESIGNED TO TEST THE ADEQUACY OF SELECTED MATERIALS IN ALL CRITICAL DESIGN AREAS. IN PHASE II RESULTS OF ANALYSIS FROM PHASE I WILL BE USED IN PROTOTYPE DETAIL DESIGNS FOR METAL (BASELINE), POLYMER, AND METAL MATRIX GEARBOXES WHICH WILL BE SHOCK, NOISE, AND VIBRATION ANALYZED AND TESTED. TEST AND ANALYTICAL RESULTS WILL BE COMPARED AND ANALYZED RESULTING IN A 'BEST-DESIGN' CANDIDATE FOR FULL-SCALE PROPULSION GEARCASES AND VALIDATED ANALYTICAL TOOLS TO AIDE IN THE DESIGN PROCESS OF FUTURE PROPULSION UNITS.

ADVANCED COMPOSITE TECHNOLOGY INC
15097 W 44TH AVE
GOLDEN, CO 80403
Program Manager: DR S CHANDRASHEKARA
Contract #:
Title: OPTICAL FIBER INSPECTION SYSTEM FOR COMPOSITE SHAFTING
Topic #: N90-300 Office: DTRC ID #: 41257

THIS PROJECT WILL PROVIDE THE NAVY WITH A LOW-COST FIBER OPTIC ENHANCEMENT TO THE "STANDARD" COMPOSITE PROPULSION SHAFTS IT PROPOSES FOR FUTURE SHIPS. THIS ENHANCEMENT WILL PROVIDE THREE SPECIFIC ADVANTAGES. FIRST, IT WILL PROVIDE A MEANS OF QUALITY CONTROL

THROUGH THE SCIENTIFIC MONITORING OF THE THICK WALL COMPOSITE DURING MANUFACTURE. SECOND, IT WILL PROVIDE A MEANS OF "REAL-TIME" MONITORING OF THE CONDITION OF THE SHAFT WHILE IT IS IN OPERATION AND UNDER LOAD. THIRD, IT WILL PROVIDE A MEANS OF LOCATING AND QUANTIFYING THE EXTEND OF ANY DAMAGE TO THE SHAFT. THIS WILL BE ACCOMPLISHED THROUGH THE SELECTION OF SPECIFIC FIBER OPTICS AND THE DEVELOPMENT OF A THREE DIMENSIONAL SPACING (MATRIX) SYSTEM OF PLACING THE OPTICS WITHIN THE COMPOSITE. THE PROPOSED "SMART SKINS" CONCEPT WILL RESULT IN THE NAVY BEING ABLE TO MONITOR THE HISTORY AND CONDITION OF THE COMPOSITE SHAFT FROM ITS INITIAL MANUFACTURE THROUGH ITS OPERATION ABOARD A SHIP.

ADVANCED COMPOSITE TECHNOLOGY INC
15097 W 44TH AVE
GOLDEN, CO 80403
Program Manager: LARRY G ADAMS
Contract #:
Title: COMPOSITE ACOUSTICAL ENCLOSURE FOR INTERCOOLED RECUPERATED ICR GAS TURBINE ENGINE
Topic #: N90-301 Office: DTRC ID #: 41258

THIS PROJECT PROPOSES AN ADVANCED COMPOSITE, MODULAR ENCLOSURE FOR FUTURE NAVY INTERCOOLED RECUPERATED (ICR) GAS TURBINE ENGINES. THE ENCLOSURE ENVISIONED BY ADVANCED COMPOSITE TECHNOLOGY, INC (ACT) WILL BE COMPOSED OF AN OUTER STRUCTURAL COMPOSITE SHELL (SCS) WITH AN INTERNAL FLEXIBLE PROTECTIVE SHROUD (PS). THE MODULAR CONCEPT WILL ALLOW EASY REMOVAL AND ACCESS TO THE ENGINE FOR INSPECTION, MAINTENANCE, AND REPLACEMENT WITHOUT THE USE OF CRANES OR HEAVY MACHINERY. THE STRUCTURAL COMPOSITE SHELL WILL SEAL THE ENGINE COMPONENTS FROM FLOODING AS WELL AS PROVIDE AN ACOUSTIC AND THERMAL BREAK. THE PROTECTIVE SHROUD WILL BE DESIGNED TO PREVENT NBC CONTAMINATION OF THE ENGINE ROOM AS WELL AS CONTAIN AN ENGINE BLAST OVERPRESSURE, FIRE, FUEL SPRAY, AND TURBINE BLADE OR METAL SPLATTER IF THE ENGINE OVERSPEEDS TO DESTRUCTION.

ADA TECHNOLOGIES INC
304 INVERNESS WAY S - STE 110
ENGLEWOOD, CO 80112
Program Manager: DR MICHAEL D DURHAM
Contract #:
Title: DEVELOPMENT OF AN ELECTROSTATIC SCRUBBER FOR SHIPBOARD AIR CONTAMINATION CONTROL
Topic #: N90-302 Office: DTRC ID #: 41259

THE NAVY HAS IDENTIFIED A NEED FOR AN IMPROVED TECHNOLOGY TO PROVIDE CONTROL OF PARTICULATE AND GASEOUS CONTAMINANTS TO PROTECT SHIPBOARD PERSONNEL AND EQUIPMENT. THE NEW SYSTEM SHOULD BE A NON-BARRIER TYPE FILTRATION DEVICE WITH THE FOLLOWING CHARACTERISTICS: VERY LOW PRESSURE DROP, REQUIRE LITTLE MAINTENANCE, BE INSENSITIVE TO CHANGES IN AMBIENT CONDITIONS SUCH AS TEMPERATURE, PRESSURE, AND MOISTURE, AND PROVIDE HIGH EFFICIENCY REMOVAL OF TOXIC GASES AND PARTICLES. ADA TECHNOLOGIES WILL DESIGN AND EVALUATE AN AIR CONTAIMINATION CONTROL SYSTEM FOR SHIPBOARD VENTILATION SYSTEMS USING AN ELECTRO-STATICALLY ENHANCED ATOMIZED LIQUID SPRAY SYSTEM. SEVERAL CONFIGURATIONS OF THE CONCEPT WILL BE EVALUATED INCLUDING SINGLE-STAGE AND TWO-STAGE PRECIPITATION AND PARTICLE PRECHARGING. THE ELECTROSTATIC ENHANCEMENT WILL PROVIDE THE COLLECTION MECHANISM REQUIRED TO EFFICIENTLY COLLECT PARTICLES IN THE 0.1 TO 1.0 MICRON RANGE THAT ARE EXTREMELY DIFFICULT TO COLLECT USING AN INERTIAL SPRAY SYSTEM. THIS SYSTEM ALLOWS USE OF NOZZLES DESIGNED TO PRODUCE A VERY FINE SPRAY TO OPTIMIZE THE SURFACE AREA FOR GAS REMOVAL. THE ELECTROSTATIC COLLECTOR ALSO ELIMINATES THE NEED FOR A HIGH PRESSURE DROP INERTIAL MIST ELIMINATOR.

TAYLOR S R & ASSOCS
516 SW KAW
BARTLESVILLE, OK 74003
Program Manager: DR SCOTT R TAYLOR
Contract #:
Title: NOVEL ATOMIZATION FOR EFFICIENT LIQUID FILTRATION
Topic #: N90-302 Office: DTRC ID #: 41260

ATOMIZED LIQUID SPRAY FILTRATION SYSTEMS ADDRESS THE DEFICIENCIES OF THE CURRENT BARRIER-TYPE FILTRATION SYSTEMS. PRESSURE DROP ACROSS THE LIQUID SPRAY IS LOW BECAUSE THERE IS NO OBSTRUCTION TO THE AIRFLOW; THUS THE SYSTEM WILL REQUIRE LESS SPACE AND CAN OPERATE WITH CONVENTIONAL VENTILATION FANS. THE PRESSURE DROP DOES NOT INCREASE WITH TIME BECAUSE THERE IS NO BUILDUP OF PARTICULATE ON A FILTER MEDIA; THE CONTAMINATION IS CARRIED FROM THE FILTRATION SITE BY THE LIQUID. S.R. TAYLOR AND ASSOCIATES HAS BEEN DEVELOPING A NOVEL ULTRASONIC ATOMIZER THAT OFFERS SIGNIFICANT ADVANTAGES OVER TRADITIONAL TWO FLUID ATOMIZERS. OUR INVENTION ALLOWS ATOMIZATION OF ANY LIQUID OVER A WIDE RANGE OF FLOW RATES WHERE THE ATOMIZED DROPLET SIZE IS INDEPENDENT OF THE LIQUID FEED RATE. NO OUTSIDE SOURCE OF ENERGY OTHER THAN ELECTRICAL ENERGY TO DRIVE THE ULTRASONIC TRANSDUCER IS REQUIRED. SRTA, ALONG WITH ITS SUBCONTRACTOR SOUTHWEST RESEARCH INSTITUTE, PROPOSES TO USE ITS EXPERIENCE WITH ULTRASONICS AND AIR FILTRATION TO DEVELOP AN ULTRASONIC ATOMIZER, TO DETERMINE THE APPROPRIATE OPERATING CONDITIONS FOR SUCCESSFUL ATOMIZATION, TO USE THESE ATOMIZERS TO FILTER DUST AND VAPOR CONTAMINANTS FROM A GAS STREAM. PHASE I STUDIES WILL FOCUS ON DEMONSTRATION OF FEASIBILITY AND PRELIMINARY DESIGN STUDIES PROVIDING THE SUPPORT FOR THE PHASE II PROTOTYPE DEVELOPMENT AND ACTUAL LIQUID FILTRATION TESTING.

SANDAIRE (SAN DIEGO AIRCRAFT ENGR INC)
6805 NANCY RIDGE DR
SAN DIEGO, CA 92121
Program Manager: R HOFFMAN
Contract #:
Title: PROGRAMMED CONTROL OF SEABORNE TARGETS-CONCEPT
Topic #: N90-303 Office: NATC ID #: 41210

THIS REPORT DESCRIBES THE DESIGN OF A COMMAND, CONTROL, AND COMMUNICATIONS SYSTEM FOR SEABORNE SURFACE TARGETS WHICH PROVIDES: A. AUTONOMOUS DEPLOYMENT BY MEANS OF TEST PROFILES STORES IN AN ON-BOARD COMPUTER MEMORY. B. SATELLITE-AIDED GLOBAL POSITIONING FOR DYNAMIC CONTROL OF TARGET HEADING. LONG RANGE SATELLITE-AIDED DEPLOYMENT TO THE TEST SITE BY MEANS OF PROGRAMMED WAYPOINTS. D. LONG RANGE TRACKING AT THE CONTROL SITE BY MEANS OF SATELLITE POSITION FIXES RECEIVED FROM THE TARGET VIA DATA LINK.

SIERRA NEVADA CORP
PO BOX 903 - 2465 W OLD HWY
VERDI, NV 89439
Program Manager: JOHN P CHISHOLM
Contract #:
Title: USE OF SATELLITE BASED MOBIL COMMUNICATION SYSTEM FOR OVER THE HORIZON CONTROL OF SEABORNE POWERED TARGETS
Topic #: N90-303 Office: NATC ID #: 41031

SEABORNE POWERED TARGETS ARE CURRENTLY REMOTELY CONTROLLED VIA LINE OF SIGHT RADIO FREQUENCY SYSTEMS. IT IS DESIRED TO REMOVE THIS LINE OF SIGHT LIMITATION. THE PROPOSED SOLUTION WILL UTILIZE A TARGET BORNE LORAN C NAVIGATOR TO ESTABLISH LOCATION AND

AUTONOMOUSLY CONTROL THE TARGET BETWEEN WAYPOINTS INSERTED INTO THE NAVIGATION. LOCATION DATA WILL BE COMMUNICATED TO A CONTROL STATION, FOR MONITORING PURPOSES AND CONTROL SIGNALS, I.E., TO SHUT DOWN THE TARGET, RELAYED BACK TO THE TARGET VIA A SATELLITE BASED COMMUNICATION SYSTEM. THE PROPOSED PHASE I PROGRAM HAS BOTH DEMONSTRATION AND STUDY PARTS. IN THE DEMONSTRATION A TARGET WILL BE REMOTELY CONTROLLED AS NOTED ABOVE. THIS DEMONSTRATION WILL BE BASED ON THE RECENTLY (1989) INTRODUCED USE OF SATELLITE BASED DUPLEX MOBILE COMMUNICATION TECHNOLOGY, AND ASSOCIATED HARDWARE, FOR COMMERCIAL PURPOSES (TRUCK LOCATION AND DISPATCH). BECAUSE OF THE POTENTIAL, VERY SIGNIFICANT IMPACT OF THE ABOVE DEMONSTRATION TO WIDE SCALE RANGE USE, AN ASSOCIATED PART OF THIS PHASE I EFFORT WILL PROVIDE A FIRST COST ESTIMATE OF ADDITIONAL RANGE USE OF THE CONCEPT/HARDWARE.

NONVOLATILE ELECTRONICS INC
5805 AMY DR
EDINA, MN 55436
Program Manager: JAMES M DAUGHTON
Contract #:
Title: SOLID STATE DIGITAL VOICE/DATA RECORDER
Topic #: N90-304 Office: NATC ID #: 41032

MAGNETORESISTIVE RANDOM ACCESS MEMORY (MRAM) IS USED TO CREATE A VERY RELIABLE NONVOLATILE RECORDING DEVICE CONCEPT SUITABLE FOR STORING AT LEST 15 MINUTES OF AIRCRAFT FLIGHT DATA ALONG WITH ONE CHANNEL OF VOICE COMMUNICATIONS, AND TO DESIGN AND BUILD A BRASSBOARD RECORDING DEVICE TO DEMONSTRATE THE CRITICAL FEATURES OF THE DESIGN CONCEPTS. BOTH ELECTRICAL AND PACKAGE DESIGN OF THE MRAM AND CIRCUIT BOARD WILL BE CAREFULLY CONSIDERED TO EXTEND RELIABLE OPERATION BEYOND EXISTING CAPABILITY. THE DESIGN GOAL IS TO DEMONSTRATE STORAGE PROTECTION OF CRITICAL DATA TO MORE THAN 300 DEG C AND TO WITHSTAND SHOCK OF GREATER THAN 5000 g's. COST, WEIGHT, AND OPERATING POWER WILL ALSO BE CONSIDERED. THE BRASSBOARD WILL USE 16K MRAMs, SOME OF WHICH ARE NOW AVAILABLE. THE DESIGN CONCEPT WILL INVOLVE MRAM CAPACITIES OF AT LEAST 1mbit, WHICH WILL BE AVAILABLE IN 1991.

SEAKR ENGINEERING INC
23763 MADISON ST
TORRANCE, CA 90505
Program Manager: SCOTT R ANDERSON
Contract #:
Title: SOLID STATE DIGITAL VOICE/DATA RECORDER
Topic #: N90-304 Office: NATC ID #: 41211

SEAKR ENGINEERING, INC. WILL DEVELOP AND DEMONSTRATE A SOLID STATE AIRCRAFT VOICE AND DATA RECORDER DESIGN WHICH WILL USE BOTH DATA ENCRYPTION AND DATA COMPRESSION. THE FIRST PART OF THE EFFORT WILL BE DEVOTED TO EVALUATING AVAILABLE OFF THE SHELF HARDWARE AND ALGORITHMS WHICH CAN BE USED TO PERFORM THE ENCRYPTION AND COMPRESSION OPERATIONS. ALSO DURING THIS TIME THE STATUS OF SOLID STATE NON-VOLATILE MEMORY DEVICES SUCH AS MAGNETIC BUBBLE MEMORY (MBM), ELECTRICALLY ERASABLE PROGRAMMABLE READ ONLY (EEPROM), AND FERROELECTRIC RANDOM ACCESS MEMORY (FRAM) WILL BE EVALUATED. AT THE CONCLUSION OF THESE EVALUATIONS, DATA ENCRYPTION AND DATA COMPRESSION METHODS WILL BE SELECTED AND THE NON-VOLATILE MEMORY DEVICES WILL BE CHOSEN. THE SOLID STATE VOICE/DATA RECORDER WILL THEN BE DESIGNED AND A DEMONSTRATION RECORDER BUILT AND TESTED. THIS RECORDER WILL BE SMALL, LIGHT WEIGHT, AND BE CAPABLE OF BEING PACKAGED INTO A SURVIVABLE CRASH RECORDER IN PHASE II.

SPECTRUM SCIENCES INC
PO BOX 788
CALIFORNIA, MD 20619
Program Manager: RONALD J SPICUZZA
Contract #:
Title: SOLID STATE FLIGHT DATA/VOICE RECORDER
Topic #: N90-304 Office: NATC ID #: 41033

SOLID STATE FLIGHT DATA/VOICE RECORDERS (SSFD/VR) USE EXPENSIVE SEMICONDUCTOR MEMORY DEVICES TO STORE SENSOR PARAMETER DATA AND VOICE DATA FOR ANY GIVEN FLIGHT. THE RECORDING TIMES FOR LARGE CIVILIAN AIRCRAFT CAN BE AS MUCH AS 25 HOURS FOR CONTINUOUS RECORDING OF SENSOR PARAMETER DATA AND 30 MINUTES FOR THE COCKPIT VOICE CHANNELS. THIS DATA REQUIRES VERY DENSE (AND CONSEQUENTLY EXPENSIVE) SEMI- CONDUCTOR MEMORY DEVICES TO CONTAIN THE RAW RECORDED DATA. ONE METHOD OF REDUCING THE REQUIREMENT FOR LARGE AMOUNTS OF SEMICONDUCTOR MEMORY IS TO COMPRESS THE DATA BY APPLYING DATA COMPRESSION TECHNIQUES CURRENTLY AVAILABLE. SPECTRUM SCIENCES, INC. PROPOSES TO EVALUATE DIFFERENT COMPRESSION TECHNIQUES FOR SENSOR PARAMETER DATA BY COLLECTING PERFORMANCE DATA DURING ACTUAL EXECUTION OF PROGRAMMED ALGORITHMS. VOICE COMMUNICATION REQUIRES A DIFFERENT APPROACH TO DATA COMPRESSION. LARGE AMOUNTS OF SEMICONDUCTOR MEMORY CAN BE USED UP QUICKLY IF COMPRESSION TECHNIQUES ARE NOT UTILIZED. A NEW FEDERAL STANDARD ALGORITHM FOR LINEAR PREDICTIVE CODING (LPC) HAS RECENTLY BEEN RELEASED. THE ALGORITHM REDUCES THE VOICE COMMUNICATIONS TO A LOW 4800 BITS PER SECOND DATA STREAM WHILE STILL MAINTAINING INTELLIGIBILITY. A SECOND PROPOSED TASK IS TO PERFORM A TOP LEVEL SYSTEM DESIGN TO DEVELOP THE METHODOLOGY FOR IMPLEMENTING THE NEW FEDERAL STANDARD.

CORTLAND CABLE CO
177 PORT WATSON ST
CORTLAND, NY 13045
Program Manager: DOUGLAS P BENTLEY
Contract #:
Title: SYNTHETIC ROPE FOR HELICOPTER RESCUE HOISTS
Topic #: N90-305 Office: NATC ID #: 41034

SINCE HELICOPTERS WERE FIRST USED FOR RESCUE ACTIVITIES AND AIR CARGO LIFT OPERATIONS, THERE HAS ALWAYS BEEN A POTENTIAL HAZARD ASSOCIATED WITH THE HIGH ELECTROSTATIC POTENTIAL OF THE AIRCRAFT RELATIVE TO THE EARTH GROUND BELOW DURING MISSIONS CONDUCTED IN SNOW, RAIN OR DUST. THE PRESENCE OF THESE ELEMENTS IN THE FLIGHT ENVIRONMENT CREATES A SEVERE CHARGING PROBLEM AS STATIC POTENTIAL ACCUMULATES RAPIDLY AND REACHES LEVELS GREAT ENOUGH TO CAUSE SEVERE BURNS OR DEATH TO PERSONNEL, SHOULD THEY PROVIDE A DIRECT GROUND PATH FROM THE AIRCRAFT TO EARTH. RECENT ADVANCES IN THE DEVELOPMENT OF HIGH MODULUS MULTIFILAMENT MATERIALS PROVIDE THE OPPORTUNITY TO DESIGN A NON-METALLIC ALTERNATIVE TO THE WIRE ROPE HOIST CABLE. WE PROPOSE TO DESIGN AND FABRICATE HOIST CABLES WITH EACH OF THREE CANDIDATE FIBERS (KEVLAR, TECHNORA AND SPECTRA) WITHIN THE PRESENT HOIST CABLE HARDWARE ENVELOPE. BY TEST, WE WILL DETERMINE THE FATIGUE PROPERTIES OF THESE CABLES. MICROSCOPIC EXAMINATION OF FILAMENT DAMAGE WITHIN THESE CABLES AFTER CYCLING WILL BE CORRELATED WITH EACH CABLE'S COMPOSITION AND LOAD HISTORY TO SELECT THE BEST MATERIAL/DESIGN COMBINATION. RELIABLE INSPECTION AND RETIREMENT CRITERIA FOR SYNTHETIC HOIST CABLES WILL BE DEFINED TO ASSURE THE RELIABILITY AND MINTAINABILITY OF THIS NEW HARDWARE.

HYPERFORMANCE ARMOR INC
8824 NATIONAL BLVD

CULVER CITY, CA 90232
Program Manager: VIC SAFFIRE
Contract #:
Title: HYPERFORMANCE SYNTHETIC ROPE
Topic #: N90-305 Office: NATC ID #: 41035

HYPERFORMANCE ARMOR IS PROPOSING A UNIQUE PROCESS FOR FABRICATING MATERIAL INTO NON-ELECTROSTATIC, CONTAMINANT RESISTANT, ULTRA HIGH STRENGTH TO WEIGHT RATIO YARN THAT CAN BE USED AS CORES AND SHEATHINGS FOR NON-METALLIC ROPE FOR HELICOPTER HOISTS. THE ROPE FABRICATION PROCESS IS DESCRIBED. VARIOUS FIBERS AVAILABLE FOR THE PROCESS ARE PRESENTED. EMPHASIS IS ON HIGH MODULUS FIBERS ABLE TO HANDLE HIGH STRESS LEVELS WITH LITTLE OR NO DEFORMATION IN THE FIBER. CANDIDATE HIGH MODULUS FIBERS ARE INORGANIC (GLASS, CERAMICS, GRAPHITE AND STEEL) AND ORGANIC ARAMIDS (KEVLAR AND KEVLAR VARIANTS) AND POLYETHYLENES (SPECTRA, DYNEEMA AND OTHER VARIANTS). THEIR PROPERTIES AND CHARACTERISTICS ARE PRESENTED. THE POLYETHYLENES REPRESENT THE LOWEST DENSITY FIBERS, ARAMIDS AND GLASS FIBERS BEING ABOUT 1.5 TO .18 TIMES HEAVIER. GLASS AND CERAMIC FIBERS ARE APPROSIMATELY 2.5 TIMES HEAVIER THAN POLYETHYLENES, STEEL IS THE HEAVIEST FIBER WEIGHING ABOUT 8 TIMES THAT OF POLYETHYLENE. THE WEIGHT OF THE ROPE PER UNIT LENGTH DEPENDS ON THE LOAD, TENSILE STRENGTH OF THE FIBER AND DENSITY OF THE MATERIAL. ROPE DIAMETER VARYING FROM 0.044" (GLASS) TO 0.08" (STEEL) ARE SHOWN FOR COMPARISON.

ADVANCED COUNTER-MEASURE SYSTEMS
9838 OLD PLACERVILLE RD
SACRAMENTO, CA 95827
Program Manager: RANDEL E ROZANSKI
Contract #:
Title: THREAT MISSILE SIMULATOR TECHNOLOGY
Topic #: N90-306 Office: NAC ID #: 41036

THE OBJECTIVE OF THIS SBIR PROJECT IS TO IDENTIFY THE MEANS TO SUBSTANITALLY REDUCE THE SIZE AND WEIGHT OF THE ALQ-170 ELECTRONICS PACKAGE WHILE IMPROVING THREAT SIGNAL FIDELITY AND ADDING VERSATILITY. THE INITIAL EFFORT CONSISTS OF A STUDY TO BASELINE THE CURRENT PERFORMANCE OF THE ALQ-170 AND ITS SUBSYSTEMS, AND IDENTIFY AREAS WHERE IMPROVEMENT IS REQUIRED. NEXT, SUBSYSTEM PERFORMANCE SPECIFICATIONS ARE GENERATED. THEN APPLICABLE MODERN TECHNOLOGY AND PACKAGING TECHNIQUES ARE INVESTIGATED. SOME AREAS TO BE INVESTIGATED INCLUDE HIGH POWER MICROWAVE TRANSMITTERS, MICROPROCESSOR AND DIGITAL ELECTRONICS, MICROWAVE COMPONENT AND RECEIVER TECHNOLOGY, STRUCTURAL MATERIALS AND DESIGN, HIGH DENSITY PACKAGING TECHNIQUES, POWER SUPPLIES, COOLING, AND CABLES AND CONNECTORS. THESE MODERN TECHNOLOGIES ARE INTEGRATED WITH THE PERFORMANCE REQUIREMENTS TO PRODUCE A RECOMMENDED DESIGN CONCEPT.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
Program Manager: DR PHILLIP STARK
Contract #:
Title: INTEGRAL CIRCUIT PANEL/FRAME/HEAT SINK
Topic #: N90-308 Office: NAC ID #: 41037

COOLING OF ELECTRONICS IS A CRITICAL FACTOR IN THE DESIGN OF NAVAL AVIONICS, ESPECIALLY IN INTEGRATED RACK ELECTRONICS. PROBLEMS ASSOCIATED WITH THERMAL MISMATCH BETWEEN FRAME (USUALLY ALUMINUM) AND BOARD (OFTEN CERAMIC) REQUIRE THE USE OF THICK DHESIVE BONDS WHICH INTRODUCES HIGH THERMAL RESISTANCE IN THE PATH OF THE HEAT FLOW. FOSTER-MILLER PROPOSES

A NOVEL APPROACH TO CREATING A HIGH THERMAL DISSIPATION, HIGHLY RELIABLE INTEGRAL CIRCUIT PANEL/FRAME/ HEAT SINK. THE APPROACH COMBINES FOUR NEWLY EMERGED TECHNOLOGIES: 1. GROWTH OF CVD DIAMOND FILMS; 2. ACTIVE ALLOY BRAZING OF DIAMOND; 3. METAL MATRIX COMPOSITES WITH TAILORED PROPERTIES; 4. MULTICHIP THIN-FILM PACKAGING. IN PHASE I, CVD DIAMOND THIN FILMS WILL BE DEPOSITED ONTO A SILICON WAFER PRIOR TO DOPING. THE DIAMOND FILM PROVIDES BOTH ELECTRICAL ISOLATION AND EXCELLENT HEAT TRANSFER. COMMERCIALLY AVAILABLE, CROSSPLIED (0/90) Gr/Al COMPOSITES WITH TAILORED PROPERTIES HAVE BEEN SELECTED AS FRAME MATERIAL. THE DIAMOND-COTED SILICON WILL BE JOINED TO THE Gr/Al WITH AN INNOVATIVE TWO-COMPONENT BRAZING ALLOY FORMULATED TO WET AND STRONGLY BOND TO DIAMOND. THE HEAT TRANSFER CHARACTERISTICS OF THE CHIP-FRAME-HEAT SINK CONSTRUCTION WILL BE DETERMINED, AS WELL AS ITS MECHANICAL INTEGRITY BY MICROSCOPIC AND HOLOGRAPHIC NDT.

MISSION RESEARCH CORP
1720 RANDOLPH RD SE
ALBUQUERQUE, NM 87106
Program Manager: DR LOUIS BAKER
Contract #:
Title: VHDL SIMULATION FOR ADA SYSTEMS
Topic #: N90-309 Office: NAC ID #: 41038

WE PROPOSE A GENERIC METHODOLOGY FOR SIMULATING MICROPROCESSOR BEHAVIOR IN AN ADA ENVIRONMENT VHDL SPECIFICATION OF THE MICRO- PROCESSOR CHARACTERISTICS.

ERGON CORP
245 E 6TH ST
ST PAUL, MN 55101
Program Manager: RALPH H McCARTNEY
Contract #:
Title: AIRCRAFT STORELOADER
Topic #: N90-310 Office: NAC ID #: 41039

THIS PROPOSAL DETAILS A STUDY WHICH WILL EXAMINE THE USE OF A POWER-AUGMENTED EXOSKELETON AS AN AIRCRAFT STORELOADER. AN EXOSKELETON IS A JOINTED, EXTERNAL FRAME-WORK WORN BY A HUMAN OPERATOR IN WHICH ALL JOINTS ARE GIVEN A POWER-AUGMENTED ACTION. FORCE SENSORS DETECT USER MOVEMENTS AND, THROUGH MODERN FEEDBACK CONTROL TECHNIQUES, POWER THE EXOSKELETAL LIMBS. A USER'S STRENGTH CAN THUS BE MAGNIFIED MANY TIMES WITHOUT LOSS OF DEXTERITY OR SPEED. THE PRIMARY PROJECT GOAL IS A PERFORMANCE DEFINITION FOR AN EXOSKELETON DESIGNED TO NAVY REQUIREMENTS. THE PROJECT WILL RESEARCH AND DOCUMENT EXPECTED NAVAL OPERATING CONDITIONS, EXAMINE SPECIFIC STORELOADER TASKS, AND ADDRESS NEEDED TECHNOLOGICAL DEVELOPMENTS. THESE TECHNICAL IMPROVEMENTS WOULD INCLUDE BETTER FORCE SENSOR DESIGN, PROTECTION AGAINST STATIC ELECTRICITY DISCHARGE, RESEARCH INTO THE COUPLED FORCE SECTOR PROBLEM, A BETTER PRIME ACTUATOR TECHNOLOGY, AND PRE-ENGINEERING OF A PORTBLE POWER SUPPLY. THE PHASE I RESULTS WILL DEFINE THE FOLLOW ON PHASE II EFFORT WHICH WILL BE THE DESIGN, CONSTRUCTION, TEST, AND DELIVERY OF A COMPLETE EXOSKELETON AIRCRAFT STORELOADER.

EUREKA LABS INC
6790 FLORIN PERKINS RD
SACRAMENTO, CA 95828
Program Manager: FRED C LI
Contract #:

Title: AIRCRAFT STORELOADER
Topic #: N90-310 Office: NAC ID #: 41040

THE PROPOSED EFFORT IS TO DETERMINE THE FEASIBILITY OF DEVELOPING A ROBOTIC AIRCRAFT STORELOADER (RAS) TO HANDLE THE EXISTING PROBLEMS IN TRANSPORTING AND LOADING MILITARY STORES TO AIRCRAFTS. THIS STUDY WILL EXAMINE THE PROBLEMS IN DETAIL AND PROVIDE SEVERAL ALTERNATIVE SOLUTIONS. THE STUDY WILL EXAMINE THE CURRENT STATE-OF- THE-ART TECHNOLOGIES FOR THE DESIGN AND DEVELOPMENT OF THE PROTOTYPE RAS. THIS STUDY WILL DEFINE THE OVERALL OPERATION AND RESPONSIBILITY OF THE RAS RELATION TO THE EXISTING STORE HANDLING PROCESS. THE MAJOR TECHNICAL ELEMENTS OF THE RAS WILL BE PRELIMINARILY DESIGNED AT THE END OF PHASE I. THE MAJOR TECHNICAL ELEMENTS TO BE STUDIED INCLUDE AN AUTONOMOUS TRANSPORTER, A FULLY AUTOMATIC LOADING MECHANISM, AN INTEGRATED SENSOR SYSTEM WITH MULTIPLE SENSOR TYPES, A MULTI-PROCESSING COMPUTER SYSTEM, AND THE SOFTWARE MODULES FOR CONTROLLING THE OPERATION OF THE RAS. THIS STUDY WILL ALSO ADDRESS SAFETY, MAN MACHINE INTERFACE, AND OTHER ISSUES THAT ARE CRITICAL TO THE DEVELOPMENT OF THE RAS. ALL FINDINGS FROM THIS PROPOSED PHSE I STUDY ARE REQUIRED AND NECESSARY FOR DEVELOPING THE PROTOTYPE AND ACHIEVING THE COMMERCIALIZATION GOALS. THE AIRCRAFT STORELOADER REPRESENTS A NEW CLASS OF AUTOMATED EQUIPMENT TO BE USED IN THE MILITARY.

SARCOS RESEARCH CORP
261 E 300 S - STE 150
SALT LAKE CITY, UT 84111
Program Manager: DR FRASER SMITH
Contract #:
Title: STM-BASED HYDROPHONE SENSORS
Topic #: N90-311 Office: ONR ID #: 41365

SCANNING TUNNELING MICROSCOPE (STM) TECHNOLOGY OFFERS THE OPPORTUNITY TO FABRICATE VERY SMALL INTEGRATED SENSORS THAT EXHIBIT HIGH SENSITIVITY, AS PROTOTYPES AT GOVERNMENT AND UNIVERSITY RESEARCH LABS HAVE DEMONSTRATED. CONTEMPORARY HYDROPHONES, WHICH TYPICALLY USE PIEZOELECTRIC OR FERROELECTRIC TRANSDUCERS, HOLD THE PROSPECTS FOR HAVING BOTH THEIR LOW-END FREQUENCY RESPONSE AND THEIR SENSITIVITIES INCREASED BY AN ORDER OF MAGNITUDE IF THEIR INTERNAL SENSING ELEMENTS ARE REPLACED WITH STM-BASED ELEMENTS - A SIGNIFICANT TECHNICAL EDGE FOR CRUCIAL NAVAL MONITORING EFFORTS. SRC PROPOSES THE UTILIZATION OF STMs AS THE CENTRAL ELEMENT OF A HYDROPHONE, WITH THE PROSPECTS OF SIGNIFICANTLY HIGHER PERFORMANCE AND SMALLER PACKAGES COMPARED TO CONVENTIONAL HYDROPHONES. THIS PROPOSAL WILL INVESTIGATE THE SUITABILITY OF STM-BASED MICROSENSORS FOR HYDROPHONE APPLICATIONS, WITH PARTICULAR CONCERN FOR BANDWIDTHS, SENSITIVITIES AND RESOLUTIONS. IN SHORT, THE PHASE I EFFORT WOULD CONSIST OF SYSTEM ANALYSIS, PRELIMINARY SENSOR AND PACKAGING DESIGNS, AND PROPOSED FABRICATION PROTOCOLS. SRC AND ITS ASSOCIATES HAVE EXTENSIVE EXPERIENCE IN THE DEVELOPMENT AND INTEGRATION OF MICROSESNSORS, MICROACTUATORS, AND UNDERWATER TELEROBOTICS. IN ITS PAST EFFORTS, SRC HAS EMPHASIZED INTEGRATED, COMPLETE SYSTEMS RATHER THAN ISOLATED DEMONSTRATIONS OF FEASIBILITY. AS A RESULT, THE PROPOSED PHASE I EFFORT IS AIMED AT EXAMINING STM TECHNOLOGY AS A ROBUST, PRACTICAL APPROACH TO HYDROPHONIC SENSING.

SAT-CON TECHNOLOGY CORP
12 EMILY ST
CAMBRIDGE, MA 02139
Program Manager: DR RALPH C FENN
Contract #:
Title: MICROFABRICATION OF TUNNELING TIP MAGNETOMETERS
Topic #: N90-311 Office: ONR ID #: 41364

PREVIOUSLY DESIGNED MAGNETOMETERS USING A TUNNELING-TIP TO MEASURE MAGNETOSTRICTIVE EXPANSIONS HAVE IMPORTANT LIMITATIONS INCLUDING HIGH SENSITIVITY TO VIBRATION AND TEMPERATURE. THIS WORK WILL DESIGN A MICROFABRICATED MAGNETOMETER BASED ON THESE SAME PRINCIPLES THAT HAS MANY ADVANTAGES OVER THE PREVIOUS DESIGNS. THESE BENEFITS INCLUDE LOW VIBRATION AND TEMPERATURE SENSITIVITY, LOW COSTS, SMALL ENVELOPE AND LOW POWER CONSUMPTION. LOW VIBRATION SENSITIVITY RESULTS FROM HIGHER STIFFNESS OF MICROFABRICATED COMPONENTS. TEMPERATURE SENSITIVITY IS REDUCED THROUGH A MECHANICAL DESIGN THAT USES THE HIGH REPRODUCIBILITY OF MICROFABRICATED FEATURES. THE WORK WILL BE DIVIDED INTO FIVE TASKS: 1. DESIGN OF THE MAGNETOSTRICTIVE AND ACTUATING COMPONENTS, 2. SELECTION OF APPROPRIATE PROCESSES, 3. PRODUCTION OF PROCESS SAMPLES, 4. IDENTIFICATION OF REQUIRED TUNNELING ELECTRONICS, AND 5. EXPLORATION OF MODULATION TECHNIQUES. THIS PROJECT WILL RESULT IN THE DESIGN OF A MICROFABRICATABLE MAGNETOMETER WITH SUPERIOR MAGNETIC AND MECHANICAL PROPERTIES USING STATE-OF-THE-ART PROCESSES. NEW APPLICATIONS MAY INCLUDE HIGH VIBRATION ENVIRONMENTS SUCH AS AIRCRAFT AND SURVEILLANCE OF LARGE AREAS AS FREE-STANDING ANOMALY SENSORS.

ADVANCED TECHNOLOGY MATERIALS INC

520-B DANBURY RD
NEW MILFORD, CT 06776
Program Manager: BO-YANG LIN
Contract #:
Title: GROUP IV SEMICONDUCTOR ATOMIC LAYER EPITAXY
Topic #: N90-312 Office: ONR ID #: 41366

WIDESPREAD APPLICATION OF HIGH PERFORMANCE DEVICES BASED ON III-V, IV-IV, OR DIAMOND COMPOUND SEMICONDUCTORS WILL DEPEND ON THE DEVELOPMENT OF MANUFACTURING METHODS. RECENTLY, DR. MAX YODER OF ONR PROPOSED A RADICALLY NEW GROWTH SEQUENCE APPLICABLE TO THE GROUP IV SEMICONDUCTORS IN GENERAL AND TO DIAMOND IN PARTICULAR. FOR DIAMOND, IT IS ANTICIPATED THAT ALTERNATE INTRODUCTION OF CH4 AND CF4 TO THE DIAMOND GROWTH SURFACE WILL PERMIT ATOMIC LAYER EPITAXIAL GROWTH OF DIAMOND. FUNDAMENTAL SURFACE SCIENCE AND CHEMICAL STUDIES ARE REQUIRED TO ESTABLISH THE DETAILS OF THE GROWTH MECHANISMS. IN PHASE I, ISOTOPIC LABELLING EXPERIMENTS WILL BE COMBINED WITH SURFACE SPECTROSCOPY TO UNEQUIVOCALLY ESTABLISH LAYER BY LAYER GROWTH OF DIAMOND. IN PHASE II, THE PROCESS FOR DIAMOND ALE WILL BE OPTIMIZED AND ITS APPLICABILITY TO THE FABRICATION OF ABRUPT p-n JUNCTIONS DEMONSTRATED.

AERODYNE RESEARCH INC
45 MANNING RD
BILLERICA, MA 01821
Program Manager: ANDREW FREEDMAN
Contract #:
Title: ATOMIC LAYER EPITAXY OF DIAMOND
Topic #: N90-312 Office: ONR ID #: 41367

THE ABILITY TO GROW HETEROSPITAXIAL THIN FILMS OF DIAMOND IS LIMITED IN PART BY THE PROPENSITY OF SUCH FILMS TO NUCLEATE AT MULTIPLE SITES WITHOUT PROPER ORIENTATION. WE PROPOSE TO DEVELOP A 2-DIMENSIONAL GROWTH PROCESS BY ATOMIC LAYER EPITAXY (ALE) USING ADVANCED MOLECULAR BEAM TECHNIQUES. THE PHASE I RESEARCH WILL FOCUS ON DETERMINING THE MICROCHEMISTRY OF DEPOSITION PROCESSES AND THUS ALLOW FOR DETERMINATION OF A PROPER ALE SCHEME.

SCHMIDT INSTRUMENTS INC
2476 BOLSOVER - STE 234
HOUSTON, TX 77005
Program Manager: DR HOWARD K SCHMIDT
Contract #:
Title: GROUP IV SEMICONDUCTOR ATOMIC LAYER EPITAXIAL TECHNOLOGY DIAMOND ATOMIC LAYER EPITAXY
Topic #: N90-312 Office: ONR ID #: 41368

DIAMOND HAS EXTREMELY HIGH THERMAL CONDUCTIVITY, A LARGE BANDGAP, HIGH CARRIER MOBILITIES AND LOW NEUTRON AND IONIZING RADIATION DISLOCATION CROSS SECTIONS. THESE PHYSICAL PROPERTIES MAKE IT AN IDEAL MATERIAL FROM WHICH TO CONSTRUCT ELECTRONIC DEVICES FOR HIGH TEMPERATURE, HIGH FREQUENCY AND/OR HIGH RADIATION APPLICATIONS. ONE PARTICULARLY IMPORTANT APPLICATION OF DIAMOND LIES IN SUPERLATTICE STRUCTURES WITH OTHER HIGH BANDGAP MATERIALS SUCH AS CUBIC BORON NITRIDE (cBN). DIAMOND: cBN STRUCTURES MAY USED TO FABRICATE ADVANCED HIGH MOBILITY ELECTRON TRANSISTORS (HEMTs) AS WELL AS NOVEL PHOTONIC DEVICES. ATOMIC LAYER EPITAXY (ALE) AFFORDS THE BEST MEANS OF FABRICATING SUCH STRUCTURES, AND HAS BEEN DEMONSTRATED FOR cBN BUT IS UNKNOWN FOR DIAMOND. THEREFORE, IN PHASE I WE SHALL SURVEY AND EVALUATE SEVERAL PROMISING CANDIDATE DIAMOND ALE PROCESSES USING OUR UNIQUE

IN-SITU DIAGNOSTICS UNDER GROWTH CONDITIONS. THIS EFFORT IS HIGHLY COMPLEMENTARY TO OUR ONGOING DIAMOND RESEARCH, AND WILL USE INSTRUMENTATION IN HAND OR ALREADY UNDER CONSTRUCTION UNDER A SEPARATELY FUNDED EFFORT. AS SUCH, WE CAN EXPLORE THIS OPPORTUNITY RAPIDLY WITH MINIMAL EXPENSE AND RISK DURING PHASE I. PHASE II AND III EFFORTS WILL CONCENTRATE ON DEVELOPING A COMMERCIAL INSTRUMENT AND PROCESS FOR FORMING DEVICE QUALITY MATERIAL BY ALE.

BIOSPHERICAL INSTRUMENTS INC
4901 MORENA BLVD - STE 1003
SAN DIEGO, CA 92117
Program Manager: DR JOHN MORROW
Contract #:
Title: REMOTE OPTICAL PROPERTY ENVIRONMENTAL SENSOR (ROPES)
Topic #: N90-313 Office: ONR ID #: 41369

THE PROPOSED REMOTE OPTICAL PROPERTY ENVIRONMENTAL SENSOR (ROPES) ADDRESSES THE NEED FOR AN EASILY DEPLOYABLE OPTICAL SENSOR SYSTEM WITH THE ABILITY TO MEASURE SIMULTANEOUSLY A FULL SUITE OF APPARENT AND INHERENT OPTICAL PROPERTIES. THE COMPACT NATURE OF THIS SENSOR SYSTEM WILL ALLOW DEPOLYMENT BY SHIPS OF OPPORTUNITY IN TOWED OR VERTICAL PROFILING MODES AND WILL ALSO ALLOW DEPOLYMENT BY ROVS OR OTHER UNCONVENTIONAL VEHICLES. THE PROPOSAL BUILDS UPON OUR EXPERIENCE IN THE OPTICAL FIBER BASED HIGH SPECTRAL RESOLUTION MEASUREMENT OF APPARENT OPTICAL PROPERTIES AND PROPOSES TO DEMONSTRATE THE ABILITY TO MAKE SPECTRAL MEASUREMENTS OF IMPORTANT INHERENT OPTICAL PROPERTIES. THE FUSION OF SENSORS MAKING BOTH INHERENT AND APPARENT OPTICAL PROPERTIES ALONG WITH EXTENSIVE FIELD TESTING AND INTERCOMPARISONS IS ANTICIPATED FOR PHASE II. ROPES ADDRESSES NEEDS OF THE NAVY TO UNDERSTAND THE INTERRELATIONSHIP OF OPTICAL PROPERTIES, AND TO BE ABLE TO MAP THESE OPTICAL PROPERTIES IN 4D ROUTINELY. TODAY, MEASUREMENTS OF INHERENT AND APPARENT OPTICAL PROPERTIES REQUIRE TEAMS OF RESEARCH SCIENTISTS DEPLOYING SEVERAL LARGE INSTRUMENT SYSTEMS AT DIFFERENT TIMES. THE APPROACH PROPOSED HERE HAS POTENTIAL TO UNIFY THESE MEASUREMENTS WITH GREAT SAVINGS IN TIME AND TO PERMIT TRUE MAPPING OF THESE UNIFIED PROPERTIES FOR THE FIRST TIME.

RD INSTRUMENTS
9855 BUSINESSPARK AVE
SAN DIEGO, CA 92131
Program Manager: STEVE BRADLEY
Contract #:
Title: 4D VELOCITY SENSOR DEVELOPMENT
Topic #: N90-313 Office: ONR ID #: 41370

THE PURPOSE OF PHASE I OF THIS PROPOSED PROJECT IS TO CONDUCT RESEARCH TO ESTABLISH THE FEASIBILITY OF DEVELOPING A 4D VELOCITY SENSOR FOR SUBSURFACE AND SURFACE VESSEL NAVIGATIONAL USE IN A WIDE RANGE OF OCEANOGRAPHIC APPLICATIONS. THE SENSOR WILL EMPLOY ACOUSTIC CORRELATION VELOCITY LOG (CVL) TECHNOLOGY TO DETERMINE THE TRUE "EARTH FRAME" VERTICAL AND HORIZONTAL COMPONENTS OF SENSOR VELOCITY AS A FUNCTION OF TIME BY CORRELATING THE ECHOES RETURNED FROM THE SEABED. THE NOVEL APPROACH PROPOSED IS THE USE OF A DUAL FREQUENCY CVL TO ACHIEVE HIGH ACCURACY OVER A WIDE RANGE OF OPERATIONAL ALTITUDES (10 TO 20,000 FEET). THE ALGORITHM APPROACH AND THEORETICAL EQUATIONS FOR DETERMINING THREE-AXIS VELOCITY, AS WELL AS A STUDY OF THE RANDOM AND BIAS ERRORS ASSOCIATED WITH THE CVL WILL BE INVESTIGATED. A CONTROLLED TEST USING RD INSTRUMENT'S EXISTING OPERATIONAL 75 KHz CORRELATION SONAR WILL BE CONDUCTED TO VALIDATE THE THEORETICAL PREDICTIONS.

ELETRONIC DESIGN CONSULTANTS
PO BOX 208 - 1110 E FRANKLIN ST
CHAPEL HILL, NC 27514
Program Manager: DR MICHAEL D FEEZOR
Contract #:
Title: AUTONOMOUS OCEANOGRAPHIC SAMPLING NETWORK
Topic #: N90-314 Office: ONR ID #: 41372

FOR FOUR DIMENSIONAL OCEANOGRAPHIC SAMPLING WITH INITIAL APPLICATION TO THE ARCTIC, AN AUTONOMOUS OCEANOGRAPHIC SAMPLING NETWORK (AOSN) IS PROPOSED. EACH NETWORK NODE IS A LOCAL VOLUME SAMPLING SYSTEM (LOVSS) CONSISTING OF A BASE BUOY AND A NUMBER OF AUTONOMOUS OCEANOGRAPHIC VEHICLES (AOV'S) AT FIXED LEVELS (ISOBARIC OR ISOPYCNAL). THE BASE BUOY SERVES AS A NAVIGATION BEACON, ENERGY SOURCE, TELEMETRY LINK AND SURFACE SENSOR PLATFORM. EACH AOV FUNCTIONS AS A SUBSURFACE SENSOR PLATFORM, SHORT TERM DATA LOGGER AND PROGRAMMABLE, NAVAGABLE VESSEL. DEVELOPMENT OF SYSTEM COMPONENTS CAPITALIZES ON RECENT INVESTMENTS BY DOD AND INDUSTRY IN BUOY AND VESSEL TECHNOLOGY. INITIAL EFFORTS WILL FOCUS ON PERFECTING VEHICLE DOCKING, RECHARGE AND DATA EXCHANGE. BASED ON RELIABLE PERFORMANCE OF THESE CRITICAL TASKS, A LOCAL AOSN WILL BE FABRICATED, TESTED AND DEPLOYED AS PART OF AN ARCTIC ICE MECHANICS EXPERIMENT (1993) TO RESOLVE THE EVOLUTION OF THREE DIMENSIONAL FIELDS OF ICE THICKNESS AND UPPER OCEAN VARIABLES AND FURTHER UNDERSTANDING OF THE UNDERLYING MECHANICS.

QUEST INTEGRATED INC
21414 - 68TH AVE S
KENT, WA 98032
Program Manager: DR JACK J KOLLE
Contract #:
Title: FIBER-OPTIC ICE STRESS SENSOR
Topic #: N90-314 Office: ONR ID #: 41371

THE PROPOSED WORK PROVIDES FOR A DEMONSTRATION OF THE FEASIBILITY OF A NEW TYPE OF FLAT-PLATE STRESS SENSOR FOR OBSERVATION OF SEA-ICE STRESSES. THE SENSOR IS DESIGNED TO MEASURE NORMAL TENSILE AND COMPRESSIVE STRESSES WHILE OVERCOMING THE ACCURACY LIMITATIONS OF EXISTING ICE STRESS MEASUREMENT TECHNIQUES. A FIBER-OPTIC TECHNIQUE IS USED TO OBSERVE STRESS. THIS TECHNIQUE PROVIDES A SIMPLE, LOW- POWER ICE STRESS MEASUREMENT TECHNIQUE SUITABLE FOR REMOTE DEPLOYMENT AS PART OF A LONG-TERM PROGRAM FOR MONITORING ARCTIC ENVIRONMENTAL PARAMETERS. THE FEASIBILITY DEMONSTRATION INCLUDES NUMERICAL AND EXPERIMENTAL EVALUATIONS OF THE PRECISION AND ACCURACY OF THE SENSOR RESPONSE UNDER VARYING CONDITIONS OF TEMPERATURE, TRANSVERSE LOADING, SHEAR LOADING AND ICE MODULUS.

CASTLE TECHNOLOGY CORP
PO BOX 5
LEXINGTON, MA 02173
Program Manager: J PAUL PEMSLER
Contract #:
Title: OXIDATION RESISTANT COATING FOR CARBON-CARBON COMPOSITES
Topic #: N90-315 Office: ONR ID #: 41373

THE RESEARCH EFFORT DESCRIBED IN THIS PROPOSAL IS DIRECTED AT DEVELOPING A NOVEL COATING SYSTEM FOR CARBON-CARBON COMPOSITES (CCC) FOR USE AT TEMPERATURES UP TO 2000C. THE OUTER EROSION/CORROSION RESISTANT LAYER IS PLASMA SPRAYED LANTHANUM HAFNATE. THE INNER COATING IS A HIGHLY ADHERENT NOBLE METAL COMPOSITE DIFFUSION BARRIER WITH A VARYING COEFFICIENT

OF THERMAL EXPANSION ACROSS ITS THICKNESS. THE SYSTEM IS DESIGNED TO AFFORD MAXIMUM PROTECTION TO CCC BY PROVIDING: 1) A CHEMICALLY INERT DIFFUSION BARRIER FOR CARBON AND OXYGEN. 2) A MEANS OF RELIEVING STRESSES DUE TO THERMAL EXPANSION MISMATCH, AND 3) AN INERT OUTER COATING WHICH IS HIGHLY STABLE IN OXIDIZING ATMOSPHERES AND ALSO MINIMIZES VAPORIZATION LOSS FROM THE NOBLE METAL BARRIER LAYER BELOW.

ULTRAMET
12173 MONTAGUE ST
PACOIMA, CA 91331
Program Manager: BRIAN E WILLIAMS
Contract #:
Title: ULTRA 2000 OPTIMIZATION AND SCALEUP FOR THE OXIDATION PROTECTION OF CARBON-CARBON COMPOSITES
Topic #: N90-315 Office: ONR ID #: 41374

THE ABILITY TO OPERATE GAS TURBINE ENGINE COMPONENTS AT TEMPERATURES OF 1600-2000 DEG C REPRESENTS A CONSIDERABLE INCREASE IN BOTH THRUST AND FUEL EFFICIENCY FOR THESE ENGINES, AND IS CRITICAL TO MEETING IHPTET PERFORMANCE GOALS. THE STRENGTH OF CARBON-CARBON COMPOSITES (C-C), PARTICULARLY AT ELEVATED TEMPERATURES, MAKES THEM AN ATTRACTIVE POTENTIAL STRUCTURAL MATERIAL FOR GAS TURBINE ENGINE APPLICATIONS. HOWEVER, THE OXIDATION THRESHOLD OF C-C IS ONLY ABOUT 370 DEG C. OPERATION AT HIGHER TEMPERATURES IN AN OXIDIZING ENVIRONMENT ULTIMATELY REQUIRES OXIDATION-PROTECTIVE COATINGS FOR EXTENDED LIFETIMES. ULTRAMET HAS DEVELOPED A PROPRIETARY OXIDATION- RESISTANT COATING SYSTEM, ULTRA 2000, BASED ON THE HAFNIUM CARBIDE/ SILICON CARBIDE (HfC/SiC) SYSTEM THAT HAS DEMONSTRATED OXIDATION PROTECTION FOR CARBON-CARBON COMPOSITES IN ONE ATMOSPHERE OF AIR AT 1800 DEG C FOR EXTENDED PERIODS (HOURS) AND TO 1925 DEG C FOR SHORTER PERIODS. THIS COATING, DEPOSITED BY CHEMICAL VAPOR DEPOSITION (CVD), UTILIZES THE FORMATION OF HAFNIUM SILICATE TO REDUCE OXYGEN DIFFUSION THROUGH THE COATING. THIS PHASE IS SIGNIFICANTLY MORE STABLE THAN CURRENT INHIBITOR MATERIALS, ALLOWING THE USE OF C-C IN THE 1600-2000 DEG C RANGE. IN THIS PHASE I PROGRAM, ULTRAMET PROPOSES TO MOVE ULTRA 2000 INTO THE NEXT STAGE OF ITS DEVELOPMENT, INVOLVING OPTIMIZATION OF THE COATING THICKNESS AND STRUCTURE IN RELATION TO BOTH THERMAL AND MECHANICAL PROPERTIES. THIS WILL BE FOLLOWED BY INVESTIGATION OF PROCESS SCALEUP TO LARGE IRREGULAR SURFACES. ULTRAMET WILL WORK CLOSELY WITH A LEADING SMALL GAS TURBINE ENGINE MANUFACTURER, WHICH WILL PROVIDE SPECIFIC DESIGN AND PERFORMANCE INFORMATION ON A SELECTED C-C TURBINE ENGINE COMPONENT, TO BE APPLIED TO THE ULTRA 2000 OPTIMIZATION AND SCALEUP EFFORT.

FTR INC
54 BROAD ST - STE 224
RED BANK, NJ 07701
Program Manager: HAROUT JAMGOTCHIAN
Contract #:
Title: A HIGH FRAME-RATE SPECTRAL INFRARED DIGITAL IMAGING DATA SYSTEM
Topic #: N90-316 Office: ONR ID #: 41376

DEVELOPMENT OF AN ADVANCED HIGH FRAME-RATE SPECTRAL INFRARED (IR) DIGITAL IMAGING SYSTEM IS PROPOSED THAT COMBINES OUR NEW HIGH FRAME- RATE IMAGING METHOD AND CONVENTIONAL SPECTROMETRY. THE NEW DIGITAL IMAGING SYSTEM WILL HAVE A FRAME-RATE FOR HIGHER THAN ANY VIDEO SYSTEM HAS EVER ACHIEVED AND THE CAPTURED IMAGES WILL BE MADE THROUGH A (WIDE OR NARROW) SPECTRAL BAND. THE HIGH-RESOLUTION DIGITAL DATA (12-BIT) OF SPECTRAL IMAGES COMPILED USING THE NEW SYSTEM WILL ENABLE US TO MAXIMIZE SCIENTIFIC INFORMATION (I.E., QUANTITATIVE IMAGING) THAT WE CAN OBTAIN OUT OF THE HIGH-SPEED MOTION OBJECTS. THE VERY HIGH FRAME-RATE IN OUR NEW SYSTEM WILL BE ACHIEVED BY USING A PARALLEL DATA ACQUISITION

METHOD TO OVERCOME SEVERAL LIMITATIONS IN IMAGER AND ELECTRONICS TECHNOLOGIES. THE PARALLEL ARCHITECTURE WILL BE ACHIEVED IN BOTH THE IMAGER DESIGN AND ELECTRONIC CIRCUITRY SO THAT THE NEW SYSTEM WILL HAVE FRAME-RATES VARIABLE FROM LOW TO VERY HIGH. SINCE THE SPECTROMETRIC IMAGE ANALYSIS IS MOST PRODUCTIVE IN THE IR RANGE, IT IS APPROPRIATE THAT WE EMPLOY IR IMAGERS IN THE NEW SPECTRAL IMAGING SYSTEM. AMONG THE (PRELIMINARY) TARGET CHARACTERISTICS OF THE NEW IMAGING SYSTEM ARE: (1) VARIABLE FRAME RATE (AT LEAST 10,000 FRAMES/SEC AND 25,000 FRAMES/SEC IS FEASIBLE; (2) VARIABLE EXPOSURE PERIOD (1 - 30,000 MICROSECONDS); (3) VARIABLE SPECTRUM IMAGING, 2-5 MICROMETERS; (4) VARIABLE APERTURE; (5) FRAME STORAGE, 256 FRAMES/SHOT OR MORE; (6) DIGITIZED DATA IN 12-BIT OUT OF THE IMAGER WITH 128 x 128 PIXELS. IT IS EMPHASIZED THAT THESE TARGET FEATURES CAN BE SUBSTANTIALLY ENHANCED THAN LISTED ABOVE BUT AT THE EXPENSE OF INCREASED COST AND COMPLEXITY DUE TO CURRENT LIMITATIONS OF THE STATE-OF-THE-ART ELECTRO-OPTICAL TECHNOLOGY. IT IS ASSURED THAT ANY TECHNOLOGICAL IMPROVEMENT, AS NEWLY EMERGES DURING THE COURSE OF THE PRESENT PROJECT TO ELIMINATE ANY LIMITATIONS, WILL BE INCORPORATED IN OUR NEW DATA SYSTEM.

PRINCETON SCIENTIFIC INSTRUMENTS INC
7 DEER PARK DR
MONMOUTH JUNCTION, NJ 08852
Program Manager: JOHN L LOWRANCE
Contract #:
Title: HIGH FRAMING RATE CAMERA
Topic #: N90-316 Office: ONR ID #: 41375

THIS PROPOSAL IS FOR THE DEVELOPMENT OF VERY HIGH FRAME RATE TELEVISION TYPE IMAGE SENSORS APPLICABLE TO CAPTURING RAPID MECHANICAL MOTION AND TRANSIENT PHOTOMETRI PHENOMENA. THE REQUIREMENT IS FOR AN IMAGE SENSOR SYSTEM CAPABLE OF CAPTURING 100 TO 1000 FRAMES AT A RATE IN THE ORDER OF 1,000,000 FRAMES PER SECOND WITH AN IMAGE FORMAT OF 500x500 PIXELS. IN THE PHASE I STUDY IMAGE SENSOR CONCEPTS WILL BE STUDIED THAT ACQUIRE AND STORE THE IMAGES IN THE IMAGE SENSOR STRUCTURE SUCH THAT THE READOUT AND DATA ACQUISITION CAN BE AT MODERATE DATA RATES COMPATIBLE WITH INEXPENSIVE DIGITAL DATA SYSTEMS.

INNOVATIVE DYNAMICS
244 LANGMUIR LAB/CORNELL RSCH & TECH PK
ITHACE, NY 14850
Program Manager: GAIL A HICKMAN
Contract #:
Title: DEMONSTRATION OF NEURAL NETWORK PERFORMANCE FOR ON-LINE HEALTH MONITORING AND INSPECTION OF AIRCRAFT
Topic #: N90-317 Office: ONR ID #: 41401

INNOVATIVE DYNAMICS IS PROPOSING TO IMPLEMENT NEURAL NETWORK SIGNAL PROCESSING SOFTWARE WITH OUR AIRCRAFT HEALTH MONITORING SYSTEM (HMS) TESTBED. HMS IS A UNIQUE DISTRIBUTED SYSTEM BASED ON "SMART STRUCTURES" TECHNOLOGY. IT HAS RECENTLY SUCCESSFULLY COMPLETED A FLIGHT TEST PROGRAM AT NASA LEWIS THAT DEMONSTRATED THE FEASIBILITY TO DETECT RIVET LINE CORROSION AND LEADING EDGE ICE ACCRETION. BY MONITORING THE RESULTANT STRUCTURAL VIBRATION SIGNATURE, HMS DETERMINES STRUCTURAL ABNORMALITIES USING A NETWORK OF ATTACHED SENSOR ARRAYS, DISTRIBUTED PROCESSORS, AND INDEPENDENT SIGNAL PROCESSING SOFTWARE MODULES. USING CONVENTIONAL MINIMUM DISTANCE CLASSIFICATION ALGORITHMS, A HIGH CLASSIFICATION ACCURACY HAS BEEN ACHIEVED. THE OBJECTIVE OF THE PROPOSED PROGRAM IS TO EXTEND THIS RESEARCH BY IMPLEMENTING NEURAL NETWORK SOFTWARE FOR PERFORMANCE COMPARISON WITH OUR PATTERN RECOGNITION BASED ON-LINE MONITORING/ INSPECTION SYSTEM. THIS SOFTWARE WILL BE IMPLEMENTED ON EXISTING FLIGHT QUALIFIED HARDWARE AND DEMONSTRATED

DURING A PHASE I GROUND TEST PROGRAM. UPON SUCCESSFUL CONCLUSION OF PHASE I, A TEST PLAN WILL BE SUBMITTED TO THE NAVY FOR A PHASE II DEMONSTRATION ON A SPECIFIC AIRFRAME USING A VARIETY OF NONDESTRUCTIVE MATERIALS MEASUREMENTS. A NEURAL NETWORK BASED SYSTEM HAS THE POTENTIAL FOR LIFETIME MONITORING OF STRUCTURAL PROPERTIES AS WELL AS PROVIDING A REAL-TIME DAMAGE DETECTION CAPABILITY CRITICAL TO NAVAL FIGHTER/ATTACK AIRCRAFT.

NETROLOGIC INC
5080 SHOREHAM PL - STE 201
SAN DIEGO, CA 92122
Program Manager: DAN GREENWOOD
Contract #:
Title: NEURAL NETWORKS AND ROBOTICS APPLIED TO THE NONDESTRUCTIVE INSPECTION AIRCRAFT
Topic #: N90-317 Office: ONR ID #: 41377

THE FUNDAMENTAL OBJECTIVE OF NETROLOGIC'S PROPOSED RESEARCH IS TO SPECIFY A MOBILE ROBOTIC AIRCRAFT INSPECTION SYSTEM WHICH IS RELIABLE, ADAPTIVE, USER FRIENDLY AND COST-EFFECTIVE. WHEN SUCH A SYSTEM BECOMES AVAILABLE TO THE NATION'S AIRLINES IT WILL ENABLE MORE FREQUENT, FASTER AND MORE ACCURATE INSPECTION FOR FATIGUE OR BENDING CRACKS IN AIRCRAFT. NETROLOGIC AND OUR SUBCONTRACTOR, SOUTHWEST RESEARCH INSTITUTE PROPOSED TO APPLY NEW METHODS IN PATTERN RECOGNITION USING NEURAL NETWORKS AND TO INVESTIGATE TECHNIQUES USED ON A MOBILE ROBOTIC DERIVETER DEVELOPED AT THE SOUTHWEST RESEARCH INSTITUTE.

FORMAL SYSTEMS DESIGN & DEVELOPMENT INC
158 N ROSS ST
AUBURN, AL 36830
Program Manager: MICHAEL H GOLDSMITH
Contract #:
Title: EMBEDDED TRANSPUTER-BASED SYSTEM DESIGN
Topic #: N90-318 Office: ONR ID #: 41402

TO DATE, MOST SAFETY-CRITICAL APPLICATIONS OF SPECIAL PURPOSE PROBLEM-ORIENTED MULTIPROCESSOR CONFIGURATIONS HAVE RELIED ON WELL- KNOWN, SIMPLISTIC STRATEGIES FOR ENSURING SATISFIABILITY OF CON- STRAINTS SUCH AS FREEDOM FROM DEADLOCK AND LIVELOCK, FAIRNESS AND REAL-TIME RESPONSIVENESS; HOWEVER SUCH STRATEGIES ARE OFTEN INEFFICIENT IN IMPLEMENTATION. WE WILL DEMONSTRATE THAT MATHEMATICAL THEORIES OF CONCURRENCY ALLOW THE VERIFICATION OF COMPLEX MULTI- PROCESSOR CONFIGURATIONS, AND THAT THESE TECHNIQUES CAN BE APPLIED TO SUBSTANTIAL PROBLEMS. IN PHASE I, WE PROPOSE A LIFE-SIZE CASE STUDY INVOLVING NETWORKS OF TRANSPUTERS AND A SIGNAL-ANALYSIS PROBLEM. AS THE SPECIFIC EXAMPLE, WE PLAN TO SPECIFY FORMALLY A TRANSPUTER NETWORK FOR REAL-TIME TARGET ACQUISITION IN AIR-TO-GROUND ATTACKS. THE CONCEPT INVOLVED IS CURRENTLY UNDER EVALUATION AT THE NAVAL WEAPONS CENTER (CHINA LAKE). TRANSPUTERS AND OCCAM ARE DIRECT IMPLEMENTATIONS OF THE THEORY OF COMMUNICATING SEQUENTIAL PROCESSES DEVELOPED AT OXFORD UNIVERSITY. THE KEY PERSONNEL AND CONSULTANTS INVOLVED IN THIS PROPOSAL ARE AMONG THE PRINCIPAL DEVELOPERS OF THIS THEORY. IN PARTICULAR, THEY ARE RESPONSIBLE BOTH FOR THE ADDITION OF REAL TIME CONCEPTS TO THE THEORY, AND FOR THE DEVELOPMENT OF THE OCCAM TRANSFORMATION SYSTEM WHICH WAS USED BY INMOS IN THE DESIGN OF THE IMS, T800 TRANSPUTER. THIS LATTER SUCCESS WAS AWARDED THE 1990 QUEEN'S AWARD FOR TECHNOLOGICAL ACHIEVEMENT.

CAPE COD RESEARCH INC
PO BOX 600
BUZZARDS BAY, MA 02532

Program Manager: DR BRIAN G DIXON
Contract #:
Title: A NEW APPROACH TO AN EFFECTIVE NON-TOXIC ANTIFOULING PAINT
Topic #: N90-319 Office: ONT ID #: 41403

A NOVEL ANTIFOULING PAINT IS PROPOSED WHICH PROMISES TO SIGNIFICANTLY ADVANCE THE STATE OF THE ART FOR THE PREVENTION OF MARINE FOULING OF ALL KINDS. THE TENET WHICH UNDERLIES THE NEW APPROACH IS THAT IT IS UNACCEPTABLE FOR ANY COMPONENT OF THE PAINT TO BE RELEASED TO THE ENVIRONMENT. WHAT IS PROPOSED IS AN INNOVATIVE, YET PRACTICAL, PAINT WHOSE SURFACE IS UNATTRACTIVE FOR COLONIZATION TO A WIDE VARIETY OF POTENTIAL FOULING ORGANISMS. IT WILL ALSO BE EFFECTIVE UNDER A WIDE VARIETY OF FOULING CONDITIONS. THE PROPOSED TECHNOLOGY INVOLVES ONLY NON-HAZARDOUS AND ENVIRONMENTALLY COMPATIBLE COMPONENTS, AND WILL BE EASILY ADAPTED TO EXISTING PAINTING APPLICATOR SYSTEMS.

IRVINE SENSORS CORP
3001 REDHILL AVE - BLDG 3/STE 208
COSTA MESA, CA 92626
Program Manager: DAVID E LUDWIG
Contract #:
Title: SHIPBORNE AND AIRBORNE TARGET EXTRACTION SENSOR
Topic #: N90-320 Office: ONT ID #: 41404

IN THE PHASE I PROGRAM ISC WILL DESIGN THE READOUT ELECTRONICS NECESSARY TO PERFORM SIGNAL PROCESSING FUNCTIONS ON THE FOCAL PLANE APPLICABLE FOR IRST MISSIONS. THE SIGNAL PROCESSING FUNCTIONS INCLUDE: PREAMPLIFICATION, SPATIAL FILTERING, ANALOG TO DIGITAL CONVERSION, GAIN AND OFFSET CONTROL, AND THRESHOLDING. THE INNOVATION WHICH IS PROPOSED IS THE INCREASE IN BANDWIDTH OF THESE FUNCTIONS FROM THE STATE-OF-THE-ART AT 1000 Hz TO THE REQUIRED 20 kHz. THIS REQUIRES A NEW APPROACH TO THE TECHNOLOGY AND SINGLE SLOPE A TO D CONVERTER TECHNOLOGY. THIS PROPOSAL DISCUSSES A NOVEL AMPLIFIER DESIGN, COMPARATOR CIRCUIT, AND INCORPORATION OF ADDITIONAL CONTROL ELECTRONICS NECESSARY FOR A 20 kHz SINGLE SLOPE A TO D CONVERTER. THIS TECHNOLOGY WILL BE APPLICABLE TO MILITARY APPLICATIONS OTHER THAN THE IRST MISSION. WHERE EVER HIGH FRAME RATE OR SCAN RATE IS REQUIRED AND A COMPENSATED DIGITAL OUTPUT IS DESIRABLE THIS TECHNOLOGY SHOULD BE CONSIDERED. THIS HOLDS FOR MILITARY OR COMMERCIAL APPLICATIONS.

ATLANTIC APPLIED RESEARCH CORP
4 'A' ST
BURLINGTON, MA 01803
Program Manager: FRED R KERN
Contract #:
Title: NON CONTACT REMOTE DIMENSIONAL GAUGING AND SHAPE MEASUREMENT
Topic #: N90-329 Office: NASC ID #: 41405

ATLANTIC APPLIED RESEARCH CORPORATION HAS BEEN DEVELOPING A VERY HIGH ACCURACY LASER SURFACE SHAPE MEASUREMENT SYSTEM. IT CURRENTLY HAS THE ABILITY TO SCAN A MEASUREMENT LASER BEAM IN ONE DIMENSION AND MEASURE THE POSITION OF THE SURFACE OF ALMOST ANY OBJECT IT STRIKES RELATIVE TO A REFERENCE PLAN. ASSUMING THAT THE AARC SYSTEM IS A COMPETITIVE TECHNOLOGY IT WOULD BE ADAPTED SO THAT THE LASER BEAM WOULD BE DIRECTED AT A STATIONARY OR ROTATING JOURNAL BEARINGS. IT COULD MEASURE FOR EXAMPLE, DIAMETER, FILLET RADII AND SURFACE DEFECTS. COMPUTER PROGRAMS WOULD BE DEVELOPED TO ACQUIRE, PLOT, AND STORE THE SHAPE DATA. MEASUREMENTS OF HIGH TEMPERATURE PARTS WOULD NOT BE A PROBLEM, SINCE THE SPEED OF LIGHT IS NOT SIGNIFICANTLY EFFECTED BY HOT GAS. THE SCANNING SYSTEM, INCLUDING THE LIGHT SOURCES AND RECEIVING PHOTO DETECTOR WOULD BE LOCATED ABOUT ONE FOOT (OR MORE)

FROM THE BEARING OR SHAFT. IT WOULD OPERATE BY GATHERING MODULATED LASER LIGHT REFLECTED OFF OF THE PART AND MEASURING THE PHASE SHIFT OF THIS LIGHT RELATIVE TO AN INTERNAL REFERENCE USING A PROPRIETORY HIGH ACCURACY PHASE MEASUREMENT SYSTEM DEVELOPED BY AARC. A SEARCH OF THE FIELD OF NON-CONTACT GAUGING TECHNOLOGIES WOULD BE INITIATED AT THE START OF THE PROGRAM TO DETERMINE THE BEST AVAILABLE TECHNOLOGIES FOR APPLICATION IN THE MACHINE STOP ENVIRONMENT.

SIERRA MONOLITHICS INC
107 W TORRANCE BLVD - STE 204
REDONDO BEACH, CA 90277
Program Manager: DR BINNEG Y LAO
Contract #:
Title: RUGGED NON-CONTACT PRECISION DIMENSIONAL GAUGE
Topic #: N90-329 Office: NASC ID #: 41407

A NOVEL NON-CONTACT DIMENSIONAL GAUGE IS PROPOSED FOR MACHINE SHOP APPLICATIONS. THE SIMPLE AND LOW-COST GAUGE USES CURRENT LASER AND CCD IMAGING TECHNIQUES AND DIGITAL SIGNAL PROCESSING TO PERFORM REMOTE (3 FEET) DIFFERENTIAL DIMENSION MEASUREMENT WITH BETTER THAN .0002 INCH ACCURACY AND A RANGE OF .4 INCH. ITS DIGITAL MEASUREMENT OUTPUT IS PROVIDED AUTOMATICALLY WITH NO OPERATOR ASSISTANCE. THE DIRECT MEASUREMENT TECHNIQUE AND THE USE OF A SIGNAL PROCESSING GIVEN DRIFT FREE AND PRECISE READINGS IN A MACHINE SHOP ENVIRONMENT. IT DOES NOT SUFFER FROM VIBRATION PROBLEMS OFTEN ENCOUNTERED BY OPTICAL INTERFEROMETERS. THE PHASE I EFFORT WILL BE 1) A PARAMETRIC ANALYSIS AND HARDWARE DESIGN FOR A BREADBOARD USING THE PROPOSED APPROACH AND 2) FABRICATION AND TEST OF THE BREADBOARD DEMONSTRATING THE FEASIBILITY OF THE APPROACH.

SYSTEMS & PROCESSES ENGR CORP (SPEC)
1406 SMITH RD
AUSTIN, TX 78721
Program Manager: ROBERT C CHIP
Contract #:
Title: NON-CONTACT MEASURING BY DIGITAL OPTICAL PHASE-LOCK-LOOP
Topic #: N90-329 Office: NASC ID #: 41406

SYSTEMS AND PROCESSES ENGINEERING CORPORATION (SPEC) HAS DEVELOPED AN ADVANCED DESIGN FOR LASER BASED, OPTICAL PHASE-LOCK-LOOP (OPLL) CAPABLE OF MEASURING THREE DIMENSIONAL ACCURACIES OF 1 MICRON (0.99994 IN) FROM A STANDOFF DISTANCE OF 1 m (APPROXIMATELY 3 FT). THIS NON-CONTACT, REAL-TIME MEASURING DEVICE, CAPABLE OF MEASURING DURING THE MACHINING PROCESS, WILL ENHANCE PRODUCTIVITY, OPTIMIZE ACCURACY AND PRECISION, AND WILL BE A CRITICAL COMPONENT OF FUTURE AUTOMATED FACTORIES. IN THE PHASE I PROGRAM, SPEC WILL PROVIDE MANUFACTURING MEASUREMENT SYSTEM REQUIREMENTS AND INTEGRATION ANALYSIS, MEASURING SYSTEM DESIGN STUDIES, SYSTEM DEFINITION AND SIMULATION, PROTOTYPE DESIGN, PHASE II PROTOTYPE DEVELOPMENTAL PLAN, AND A FINAL REPORT.

ESSEX CORP
1040 WOODCOCK RD - STE 227
ORLANDO, FL 32803
Program Manager: DR ROBERT S KENNEDY
Contract #:
Title: DEVELOPMENT OF A FLIGHT SIMULATOR VISUAL SYSTEM RECORDING/EVALUATION DEVICE
Topic #: N90-330 Office: NASC ID #: 41408

TECHNOLOGICAL ADVANCES HAVE PLACED GREATER DEMANDS ON ABILITY TO MAINTAIN TOLERANCES ON SIMULATOR SUBSYSTEMS (E.G., RESPONSES OF VISUAL AND MOTION BASE SYSTEMS AND THEIR INTERACTION). A SYSTEM TO RECORD VISUAL SCENES IN FLIGHT SIMULATORS, WHICH INCLUDES MAN-IN-THE-LOOP, IS NEEDED FOR RDTE AND ACQUISITION OF THESE TRAINING SYSTEMS. SUCH A SYSTEM WOULD BE EMPLOYED TO DETECT CHANGES IN SYSTEM OUTPUT (I.E., RUNNING OUT OF TOLERANCE) AND TO MEASURE ELEMENTS OF THE VISUAL SCENE WHICH MAY NOT BE OBSERVABLE TO TEST PILOTS, BUT WHICH INFLUENCE SYSTEMS PERFORMANCE. WE PROPOSE TO SYNTHESIZE TWO APPROACHES TO THIS REQUIREMENT: (1) A METHOD IN WHICH HUMAN OUTPUT IS USED TO MONITOR SYSTEM OUTPUT, AND (2) USE OF ENGINEERING MEASURES TO MONITOR SYSTEMS PERFORMANCE AND OPERATOR HEAD MOVEMENTS. IN PHASE I, WE WILL DEMONSTRATE THE FEASIBILITY OF RECORDING BOTH OF THESE MEASURES IN REAL TIME AND WILL SHOW THAT MORE SOPHISTICATED ANALYSIS CAN BE PERFORMED. THESE LATTER INCLUDE FOR PHASE II ISOLATING EYE MOVEMENTS PLUS STICK AND OTHER CONTROL MOVEMENTS USING MULTIDIMENSIONAL DATA STRUCTURES COMPOSED FOR IMAGES OR THE ELECTRICAL SIGNALS THAT GENERATE IMAGES. THE HUMAN PERFORMANCE METHOD WILL BE EVALUATED ACCORDING TO CRITERIA SUCH AS RELIABILITY, DIAGNOSTIC CAPABILITY, INTRUSIVENESS, AND COST. IN PHASE II, WE PROPOSE TO COMPARE THE HUMAN PERFORMANCE METHODOLOGY AGAINST ON-LINE ENGINEERING MONITORING OF SIMULATOR SYSTEMS. BOTH METHODS WILL BE RATED BY A GROUP OF ENGINEERS AND HUMAN FACTORS SPECIALISTS ACCORDING TO CRITERIA WHICH INCLUDE VALIDITY, PRACTICALITY OF RECOVERING THE NECESSARY DATA FROM PHYSICAL MEASUREMENTS AND/OR FROM COMPUTERS (GIVEN A DIVERSE SET OF SIMULATOR TYPES), COST, RELIABILITY, AND DIAGNOSTIC CAPABILITY.

OPTICS 1 INC
4035 THOUSAND OAKS BLVD - STE 105
WESTLAKE VILLAGE, CA 01362
Program Manager: MICHAEL J THOMAS
Contract #:
Title: FLIGHT SIMULATOR SYSTEM RECORDING/EVALUATION DEVICE
Topic #: N90-330 Office: NASC ID #: 41409

THERE IS A NEED TO DEVELOP A SYSTEM WHICH WILL RECORD THE INFORMATION PRESENTED TO A PILOT IN A SIMULATION DEVICE. SINCE THE PILOT CANNOT ALWAYS EXPLAIN THE PROBLEMS HE OBSERVES IN GREAT DETAIL, IT WOULD BE BENEFICIAL TO RECORD THE INFORMATION FOR PLAYBACK TO THE VIDEO ENGINEERS. THIS WILL GIVE THE VIDEO ENGINEERS A CHANCE TO REVIEW WHAT THE PILOT OBSERVED AND MAKE JUDGMENT TO ANY POTENTIAL PROBLEMS WITH THE SIMULATOR. THIS WILL HELP BREAK DOWN COMMUNICATION BARRIERS BETWEEN PILOTS AND VIDEO OPERATORS AND SPEED UP THE PROCESS OF TROUBLESHOOTING THE SIMULATORS AND DETERMINING PROBLEMS. THE PROPOSED SYSTEM WILL CAPTURE THE ENTIRE SCENE VIEWED BY THE PILOT AND RECORD IT FOR FUTURE PLAYBACK. THE MOST DEMANDING PART OF THE SYSTEM IS THE ABILITY TO RECORD THE SOMETIMES HEMISPHERICAL SCENE PRESENT IN THE SIMULATORS.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02154
Program Manager: BRUCE NAPPI
Contract #:
Title: MINIATURIZED SOLID-STATE COMPUTER SCREEN DISPLAY SYSTEM WITH INTERACTIVE VOICE CONTROL
Topic #: N90-331 Office: NASC ID #: 41410

CURRENTLY, ALMOST ALL COMPUTER SYSTEMS REQUIRE BULKY HUMAN INTERFACE DEVICES (LARGE SCREENS AND KEYBOARDS). IN CERTAIN SPACED-RESTRICTED APPLICATIONS SUCH AS AIRCRAFT AND SUBMARINES, THE BENEFITS OF ADVANCED COMPUTER TECHNOLOGY ARE FOREGONE BECAUSE OF

COMPUTER WEIGHT AND SPACE REQUIREMENTS AS WELL AS THE LACK OF MOBILITY FOR THE OPERATOR. THE OBJECTIVE OF THIS PROGRAM IS THE DEVELOPMENT OF A HIGHLY MINIATURIZED AND PORTABLE SOLID-STATE COMPUTER SCREEN DISPLAY SYSTEM WHICH MAY BE WORN AS MODIFIED EYEGLASSES AND CONTROLLED BY VOICE COMMANDS FROM THE OPERATOR. RESULT WILL LEAD TO THE DEVELOPMENT OF ALTERNATIVES TO CURRENT COMPUTER CATHODE RAY TUBES, LIQUID CRYSTAL DISPLAY AND KEYBOARD CONTROL IN SPACE-RESTRICTED ENVIRONMENTS SUCH AS AIRCRAFT OR SUBMARINES. PHASE I: IDENTIFICATION OF EXISTING "OFF-THE-SHELF" SYSTEMS, BOTH IN COMPUTER SOLID-STATE DISPLAY TECHNOLOGY AND COMPUTER INTERACTIVE VOICE CONTROL SYSTEMS, AS POTENTIAL CANDIDATES FOR PROTOTYPE DEVELOPMENT. SIMPLE PROTOTYPE DEVELOPMENT EFFORT AT THE DESKTOP COMPUTER LEVEL. PHASE II: FULL-SCALE EFFORT TO FULLY INTEGRATE AND MINIATURIZED THE TECHNOLOGIES AT A BELT-CARRIED LEVEL. DEVELOPMENT OF DEMONSTRATION HARDWARE SYSTEM. DEVELOPMENT OF DEMONSTRATION SOFTWARE FOR TWO FLEET APPLICATIONS. SYSTEM TESTING AND EVALUATION BY DESIGNATED FLEET ACTIVITIES. IDENTIFICATION OF SYSTEM ENHANCEMENTS WHICH WOULD ENHANCE FLEET INTEGRATION.

IR VISION
2922 PASEO DEL REFUGIO
SANTA BARBARA, CA 93105
Program Manager: PAUL R NORTON
Contract #:
Title: LASER SOLDERING INSPECTION SYSTEM USING THERMAL IMAGING
Topic #: N90-333 Office: NASC ID #: 41411

REAL-TIME INSPECTION OF LASER SOLDERING SHOULD MONITOR THE CRITICAL THERMAL PROCESS INVOLVED IN THE OPERATION. HISTORICALLY, INSPECTION HAS RELIED INSTEAD ON VISUAL APPEARANCE WHICH HAS BEEN INADEQUATE TO PREDICT THE FIELD FAILURE OF SOLDER JOINTS. WE PROPOSE TO STUDY THE APPLICATION OF THERMAL IMAGING TO LASER SOLDING INSPECTION. SINGLE SPOT THERMOGRAPHY IS CURRENTLY USED ON A COMMERCIAL LASER SOLDERING SYSTEM SOLD BY VANZETTI SYSTEMS. THIS CAN SUCCESSFULLY MONITOR THE THERMAL HISTORY OF THE SOLDER JOINT, BUT CANNOT SIMULTANEOUSLY INSPECT THE THERMAL CONDITION OF THE COMPONENTS AND BOARD SURROUNDING THE SOLDER JOINT IN ORDER TO PREVENT DAMAGE OR NOTE ABNORMAL COMPONENT TEMPERATURES. FOLLOWING A THOUROUGH RESEARCH OF THE CURRENT STATUS OF SOLDERING SCIENCE WITH EXISTING SYSTEMS AND A SURVEY OF EQUIPMENT VENDORS, WE PROPOSE TO USE AN IR VISION THERMAL IMAGING SYSTEM TO ACQUIRE 2 DIMENSIONAL SPATIAL THERMAL SIGNATURES OF LASER SOLDERED JOINTS AND THE SURROUNDING COMPONENTS. THIS INFORMATION WILL BE USED TO ACCESS PROCESS CONTROL ALGORITHMS BASED UPON THERMAL HISTOGRAMS. WE WILL ALSO ACCESS INTERFACING OUR THERMAL IMAGING SYSTEM WITH THE VARIETY OF LASER SOLDERING EQUIPMENT CURRENTLY ON THE MARKET.

K.E.M.P. CORP
1725 E MAGNOLIA AVE
KNOXVILLE, TN 37917
Program Manager: F E LeVERT
Contract #:
Title: EVALUATION OF EDDY-CURRENT AND BETA-BACKSCATTER TECHNIQUES FOR IN SITU MEASUREMENTS OF COMPLEX COATING THICKNESSES ON TURBINE ...
Topic #: N90-334 Office: NASC ID #: 41412

A RESEARCH AND DEVELOPMENT PROGRAM IS PROPOSED THAT WILL RESULT IN THE DEVELOPMENT OF A THICKNESS GAUGE FOR MEASURING THE THICKNESS OF CONDUCTIVE AND NONCONDUCTIVE COATINGS ON METAL SUBSTRATES. A DETAILED REVIEW AND EVALUATION OF COMMERCIAL SYSTEMS, THE TECHNICAL LITERATURE AND RESEARCH BEING CONDUCTED AT NATIONAL LABORATORIES AND UNIVERSITIES WILL BE CONDUCTED. THE PERFORMANCE OF THE IDENTIFIED COMMERCIAL SYSTEMS AND

LABORATORY PROTOTYPES WILL BE ANALYZED IN VIEW OF THEIR CAPABILITY TO MEASURE THE THICKNESSES OF SEVERAL DIVERSE CONDUCTIVE AND NONCONDUCTIVE COATINGS ON CONDUCTIVE SUBSTRATES. ALSO, ANALYSES WILL BE PERFORMED TO DETERMINE WHICH OF THE MEASURE- MENT TECHNIQUES IS OPTIMU FOR IN SITU COATING MEASUREMENTS ON VANES AND BLADES IN TURBINES. THE RESULTS OF THE SURVEY (REVIEW) AND ANALYSES WILL PROVIDE THE BASIS FOR THE TECHNIQUE RECOMMENDED FOR TESTING IN PHASE II AND THE DESIGN MODIFICATIONS OF SPECIFIC COMPONENTS NEEDED FOR IN SITU MEASUREMENTS OF COATING THICKNESSES IN TURBINES.

MATERIALS ANALYSIS INC
10338 MILLER RD
DALLAS, TX 75238
Program Manager: GRAHAM R LOBLEY
Contract #:
Title: THICKNESS GAUGING OF COMPLEX COATINGS ON TURBINE COMPONENTS
Topic #: N90-334 Office: NASC ID #: 41413

THE PRINCIPAL OBJECTIVE OF THIS PROJECT IS TO CRITICALLY EVALUATE TWO ALTERNATIVE TECHNIQUES FOR NON-DESTRUCTIVE MEASUREMENT OF COMPLEX COATINGS ON TURBINE COMPONENTS, NAMELY EDDY CURRENT AND BETA- BACKSCATTER. THE COATING EVALUATION WOULD BE CARRIED OUT ON INDIVIDUAL COMPONENTS AND ON ACTUAL PARTS INSTALLED IN ENGINES. ACHIEVEMENT OF THESE OBJECTIVES WOULD PERMIT COATING PROCESS MONITORING OF TURBINE PARTS DURING MANUFACTURE AND ACCEPTANCE TESTING AND ALSO SHOULD ENABLE ASSESSMENT OF REMAINING LIFE ON COATED TURBINE PARTS AT SELECTED SERVICE INTERVALS. BOTH INSPECTION TECHNIQUES ARE EMPIRICAL AND COMPARATIVE METHODS WHICH REQUIRE APPROPRIATE STANDARDS FOR CALIBRATION OF THE INSTRUMENTATION. THESE STANDARDS SHOULD BE SPECIFIC WITH REGARD TO MATERIAL SUBSTRATE AND COATING COMPOSITION AND APPROPRIATE AGING WOULD BE NECESSARY FOR IN SITU PART TESTING ON ENGINES FOLLOWING PERIODS IN SERVICE. A KEY PART OF THE PROJECT WOULD THEREFORE BE SELECTION AND VALIDATION OF THE NECESSARY STANDARD SAMPLES. THE INITIAL MATERIAL CONDITION AND COMPOSITION OF BOTH COATING AND SUBSTRATE MAY BE SIGNIFICANTLY MODIFIED DURING SERVICE, BY THERMAL AND ENVIRONMENTAL EFFECTS. ALTHOUGH BOTH MEASUREMENT TECHNIQUES MAY BE CONSIDERED COMPLEMENTARY, NEWER OR POTENTIAL NEW DEVELOPMENTS MAY EXTEND THE RANGES OF EACH TECHNIQUE.

ATLANTIC AEROSPACE ELECTRONICS CORP
6404 IVY LN - STE 300
GREENBELT, MD 20770
Program Manager: ANTHONY MODELFINO
Contract #:
Title: CONFORMAL UHF (SATCOM) ANTENNA FOR TACTICAL AIRCRAFT
Topic #: N90-335 Office: NASC ID #: 41414

THE OBJECTIVE OF THIS PHASE I PROPOSAL IS TO FINALIZE A PRELIMINARY DESIGN OF A UNIQUE ANTENNA ELEMENT DEVELOPED AT ATLANTIC AEROSPACE FOR USE AS A UHF SATCOM ANTENNA ON TACTICAL NAVY AIRCRAFT. THE UNDERLYING PRINCIPLES OF THE ELEMENT DESIGN ARE WIDELY USED IN MICROWAVE FILTER AND RADOME DESIGNS. IT IS BELIEVED THAT THIS ELEMENT WILL HAVE SIGNIFICANT SIZE REDUCTION (UP TO ONE FOURTH) OVER COMPARABLE UHF SATCOM ELEMENTS DEMONSTRATED TO DATE. THE ELEMENT HAS A HIGH POTENTIAL FOR SOLVING UHF SATCOM NEEDS FOR HIGH PERFORMANCE NAVY AIRCRAFT WITH IMPROVED AXIAL RATIO ON HORIZON AND CONSTANT PATTERN SHAPE OVER THE FREQUENCY BAND. THE APPROACH TAKEN TO DEVELOP AND DEMONSTRATE PERFORMANCE OF THE DESIGN WILL BE BASED ON COMPUTATIONS USING COMPUTER CODES WHICH HAVE BEEN PREVIOUSLY DEVELOPED AND VALIDATED AT ATLANTIC AEROSPACE. THE USE OF COMPRE- HENSIVE, RIGOROUS, VALIDATED ANALYSIS TO PERFORM ITERATIVE TRADEOFFS BETWEEN SPECIFICATIONS AND DESIGN

SENSITIVITIES HAS ADVANTAGES OVER A STRICTLY EMPIRICAL HARDWARE INVESTIGATION. ONE CLEAR ADVANTAGE IS THAT PERFORMANCE TRADES AND MANUFACTURING TOLERANCES CAN BE QUANTIFIED, THUS ALLOWING THE CUSTOMER TO READILY ASSESS TECHNICAL RISK ASSOCIATED WITH FABRICATING PROTOTYPE ELEMENTS IN THE HARDWARE DEMONSTRATION AND VALIDATION, WHICH WILL BE PERFORMED IN PHASE II.

LISI ENGINEERING & DEVELOPMENT CO
14825 N 50TH ST
SCOTTSDALE, AZ 95254
Program Manager: EDMUND T LISI
Contract #:
Title: AIRCRAFT WHEEL USAGE INDICATOR SYSTEMS
Topic #: N90-336 Office: NASC ID #: 41415

PROPOSAL FOR UTILIZING SOLID STATE PIEZO-RESISTIVE SENSORS TO MEASURE AND RECORD CUMULATIVE WHEEL ROTATIONS. WHEEL ROTATION IS SENSED BY EXPLOITING THE FORCE DUE TO NORMAL (CENTRIPETAL) ACCELERATION, WHICH IS A FUNCTION OF THE ROTATIONAL SPEED SQUARED. THE ELECTRONIC PACKAGE IS SMALL (INCORPORATING SMT) AND CONSISTS MAINLY OF THE SENSOR AND A MOTOROLA F68HC11 MICROPROCESSOR. THE MICROPROCESSOR IS PACKAGED AS A COMPLETE COMPUTER ON A CHIP AND OPERATES UNDER THE HIGH LEVEL LANGUAGE OF FORTH. THE COMPUTER IS PROGRAMMED USING ANY IBM PC VIA THE RS232 PORT AND BITCOM COMMUNICATIONS SOFTWARE. THE SOFTWARE PROGRAMMING EFFORT IS REDUCED BY A FACTOR OF 10 WITH THIS LANGUAGE PRESENT. THE UNIT CAN BE ADAPTED TO ANY WHEEL SIZE BY CHANGING A "LOOKUP" TABLE THAT RESIDES IN THE EEPROM. MULTIPLE SENSORS CAN BE INCORPORATED TO MEASURE THE "TAXI" MILES AND THE "LANDING MILES". TOTAL REVOLUTIONS OR MILES CAN BE RECORDED AND RESET USING A TEST INSTRUMENT THE SIZE OF A TIRE GAGE OR BY USING AN IBM PC. THE COMPLETE UNIT IS SMALL, LIGHTWEIGHT, AND CAN BE RIVETED TO THE WHEEL. THE ELECTRONICS ARE SEALED AND PROTECTED TO SURVIVE ALL LANDING ENVIRONMENTS. THE SIMPLE DESIGN FEATURES A LOW COST, DISPOSABLE UNIT.

PDI CORP
2200 SOMERVILLE RD
ANNAPOLIS, MD 21401
Program Manager: E J LECOURT JR
Contract #:
Title: AIRCRAFT BRAKE USAGE INDICATOR SYSTEM
Topic #: N90-337 Office: NASC ID #: 41416

NAVAIR HAS EXPRESSED INTEREST IN THE DEVELOPMENT OF A DEVICE WHICH MEASURES AIRCRAFT BRAKE USAGE. PDI PROPOSES TO DESIGN A BATTERY POWERED, MICROCONTROLLER BASED SYSTEM TO MEASURE BRAKE HYDRAULIC PRESSURE AND WHEEL SPEED OF ROTATION. THE PRODUCT OF THESE VARIABLES WILL BE INTEGRATED OVER THE TIME OF AN AIRCRAFT STOP TO ESTIMATE THE TOTAL ENERGY ABSORBED BY THE BRAKE. THIS WILL PROVIDE THE SYSTEM WITH THE ABILITY TO DISTINGUISH BETWEEN LOW ENERGY, NORMAL, AND HIGH ENERGY STOPS AND TO ACCUMULATE THE NUMBER OF STOPS IN EACH CATEGORY. THE TECHNICAL OBJECTIVE OF PHASE I IS TO DEMONSTRATE THE FEASIBILITY OF DEVELOPING THE PROPOSED AIRCRAFT BRAKE USAGE INDICATOR. THIS WILL BE ACCOMPLISHED THROUGH THE PRELIMINARY DESIGN OF BOTH THE HARDWARE AND SOFTWARE REQUIRED FOR SUCCESSFUL IMPLEMENTATION OF THE SYSTEM. TASK 1 OF THE PROJECT WILL ESTABLISH THE REQUIREMENTS FOR THE SYSTEM. A PRELIMINARY DESIGN OF THE SYSTEM WILL BE PREPARED IN TASK 2 INCLUDING SELECTION OF THE MICROCONTROLLER, SENSORS, AND BATTERY. SYSTEM SOFTWARE WILL BE DEVELOPED AND DEMONSTRATED IN TASK 3. PACKAGING FOR THE SYSTEM WILL BE DESIGNED IN TASK 4. DOCUMENTATION PREPARED IN TASK 5 WILL CONSIST OF A DESCRIPTION OF THE SYSTEM, BLOCK DIAGRAMS, SCHEMATIC DIAGRAMS, SOFTWARE DOCUMENTATION, AND EVALUATION OF THE FEASIBILITY

OF THE SYSTEM, AND RECOMMENDATIONS FOR PHASE II. AN APPENDIX TO THE FINAL REPORT WILL CONTAIN THE DESIGN DRAWINGS AND SPECIFICATIONS REQUIRED TO BUILD PROTOTYPE UNITS FOR INSTALLATION AND TESTING ON NAVY AIRCRAFT IN PHASE II.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02154
Program Manager: DR PHILIP STARK
Contract #:
Title: NON-ASBESTOS REPLACEMENT MATERIALS FOR NAVAL AIRCRAFT
Topic #: N90-338 Office: NASC ID #: 41467

A TWO-PHASE PROGRAM IS PROPOSED IN SUPPORT OF NAVAIRs MISSION TO ELIMINATE ASBESTOS-CONTAINING MATERIALS FROM ITS AIRCRAFT ENGINES. IN PHASE I, A THOROUGH SURVEY WILL BE MADE OF ALL COMMERCIALLY AVAILABLE, NON-ASBESTOS REPLACEMENT MATERIALS. THE SURVEY INCLUDES REVIEW OF THE PATENT AND RESEARCH LITERATURE, AND IN-DEPTH DISCUSSIONS WITH DOD PERSONNEL, ENGINE AND AIRFRAME COMPONENT MANUFACTURERS, GASKET PRODUCERS AND INDUSTRIAL FIRMS INVOLVED IN ADVANCED MATERIALS DEVELOPMENT. IN PHASE II, THE MORE PROMISING MATERIALS WILL BE EVALUATED IN STATIC SCREENING TESTS AS DEFINED BY ASTM AND DIM STANDARD TESTS, AS WELL AS MIL-G-24696(SH). THE TOP CANDIDATES WILL BE SUBJECTED TO COMPONENT PERFORMANCE TESTS AND CRITICAL COMPONENTS POSSIBLY TO 150-HR ENGINE TESTS. EXPERIMENTAL MATERIALS MAY HAVE TO BE DEVELOPED FOR THOSE APPLICATIONS WHERE NO COMMERCIAL MATERIAL QUALIFIES. PROGRAM TIMING HAS BEEN STRUCTURED TO PROVIDE NAVAIR WITH FULLY QUALIFIED, NON-ASBESTOS REPLACEMENT MATERIALS AND THE NECESSARY SUPPORTING DATA TO PERMIT IT TO ELIMINATE ASBESTOS SHEET GASKET MATERIALS FROM ITS NAVAL AIRCRAFT ENGINES *BY AUGUST 1993. FOSTER-MILLER IS QUALIFIED IN THE DEVELOPMENT AND APPLICATION OF ADVANCED*, HIGH PERFORMANCE MATERIALS. OUR ENGINEERS HAVE SUCCESSFULLY SOLVED DIFFICULT SEALING PROBLEMS IN PROPULSION ENGINES, CENTRAL POWER STATIONS AND INDUSTRIAL PROCESSING EQUIPMENT.

ADVANCED COUNTER-MEASURE SYSTEMS
9838 OLD PLACERVILLE RD
SACRAMENTO, CA 95827
Program Manager: WILLIAM TELLER
Contract #:
Title: LOW-COST ELECTRONIC WARFARE RESPONSE MONITOR
Topic #: N90-339 Office: NASC ID #: 41469

FLEET TRAINING EXERCISES UTILIZING THE AIRBORNE, MISSILE THREAT SIMULATOR POD, AST-6, CAN BE MATERIALLY IMPROVED BY THE ADDITION OF AN ECM RESPONSE MONITOR IN THE POD. THIS MONITOR WILL RECORD THE ECM RESPONE OF THE TARGET AND THE TACTICS OF ECM UTILIZATION FOR SUBSEQUENT DOWNLOAD AND DEBRIEFING. THIS APPLICATION REQUIRES A DIFFERENT APPROACH THAN CONVENTIONAL ECM SCORING SYSTEMS IN SEVERAL RESPECTS. FIRST, IT MUST BE INCORPORATED IN AN AIRBORNE POD AND WILL NOT BE ABLE TO UTILIZE THE LABORATORY TYPE EQUIPMENT THAT IS PRINCIPAL TO MOST SYSTEMS. SECOND, IT MUST OPERATE IN VERY CLOSE PROXIMITY TO THE THREAT TRANSMITTER AND SHARE A COMMON RECEIVE/ TRANSMIT RF PATH. THIRD, BECAUSE OF THE MOBILITY OF THE AIRBORNE SYSTEM IT MUST PERFORM IT'S ANALYSIS AND IDENTIFICATION TASK IN A SMALL FRACTION OF THE TIME THAT IS ACCEPTABLE IN A GROUND BASED SYSTEM. THE EQUIPMENT DEVELOPMENT PROGRAM PROPOSED ADDRESSES THESE NEW REQUIREMENTS AND DEVELOPS A NEW APPROACH TO RADAR AND ECM SIGNAL ANALYSIS.

E S C CORP

1755 JEFFERSON DAVIS HWY - STE 910
ARLINGTON, VA 22202
Program Manager: R J McGAN
Contract #:
Title: LOW-COST ELECTRONIC WARFARE RESPONSE MONITOR
Topic #: N90-339 Office: NASC ID #: 41468

THE OBJECTIVE OF THE PROPOSED PROJECT IS TO DEVELOP A LOW COST SYSTEM TO EXPAND THE CAPABILITY OF EXISTING NAVY ELECTRONIC WARFARE TRAINING ASSETS. THE SYSTEM WILL CONSIST OF A RESPONSE MONITOR RECEIVER AND RECORDER WHICH WILL RECEIVE AND RECORD ELECTRONIC RESPONSES TO AIRBORNE MISSILE THREAT SIMULATOR RADIATED SIGNALS. THE RESPONSE MONITOR WILL BE USED TO EVALUATE ECM EFFECTIVENESS DURING TRAINING EXERCISES BY POST-MISSION ANALYSIS. THE SYSTEM WILL PROVIDE TIME CORRELATION BETWEEN THE SIMULATED THREAT SIGNATURE AND THE ECM RESPONSE. THE CANDIDATE SYSTEM FOR THE PHASE I STUDY WILL BE THE AN/AST-6 THREAT MISSILE SIMULATOR POD, BUT CONSIDERATION WILL ALSO BE MADE FOR COMPATIBILITY WITH THE AN/AST-4 AND THE AN/AST-7 THREAT MISSILE SIMULATOR PODS.

GUIDED SYSTEMS TECHNOLOGIES
PO BOX 34131 - GEORGIA TECH STA
ATLANTA, GA 30332
Program Manager: J ERIC CORBAN
Contract #:
Title: ADVANCED ARMAMENT CARRIAGE FOR THE MARINE CORPS AH-1W ATTACK HELICOPTER
Topic #: N90-340 Office: NASC ID #: 41470

THE U.S. MARINE CORPS HAS A CRITICAL NEED FOR A NEW, STATE-OF-THE-ART SYSTEM FOR ARMAMENT CARRIAGE ON ITS AH-1W ATTACK HELICOPTER. THIS PHASE I EFFORT WILL PERFORM A TRADE/CONCEPTUAL DESIGN STUDY TO SYSTEMATICALLY IDENTIFY THE BEST DESIGN SOLUTION. THE MERITS, COSTS, AND RISKS ASSOCIATED WITH AN INNOVATIVE DESIGN SOLUTION (CONFORMAL WEAPONS PODS) WILL BE COMPARED TO MORE CONSERVATIVE DESIGN SOLUTIONS WHICH ONLY INCORPORATE MODIFICATIONS TO THE EXISTING ARAMENT STUBWING. A REPRESENTATIVE SET OF DESIGNS, FROM HIGH PERFORMANCE CONFORMAL WEAPONS PODS TO LOW RISK/LOW COST STUBWING MODIFICATIONS, WILL BE DEFINED. A COMPLETE SET OF SYSTEM ATTRIBUTES WILL BE CONSIDERED IN EVALUATIONS. BASED ON ENGINEERING ANALYSES, EACH DESIGN WILL BE RANKED AND THE BEST CANDIDATE (OR CANDIDATES) SELECTED FOR DETAILED STUDY IN PHASE II. ALL POTENTIAL CONCEPTS WILL PROVIDE THE MARINE CORPS WITH THE DESIRED OPERATIONAL CAPABILITY. THE PHASE I EFFORT SERVES TO IDENTIFY THE MOST PROMISING DESIGN SOLUTION (OR SOLUTIONS) AND PROVIDES FOCUS FOR A MORE COMPREHENSIVE DESIGN STUDY IN PHASE II. THE PHASE II EFFORT WILL SUBSTANTIATE THE ANALYSES OF PHASE I, FURTHER INVESTIGATE THE REMAINING DESIGN SOLUTIONS, DETERMINE THE OPTIMUM DESIGN CONFIGURATION, AND THEN PROCEED WITH DETAILED DESIGN OF THE SYSTEM.

PIASECKI AIRCRAFT CORP
WEST END 2ND ST
ESSINGTON, PA 19029
Program Manager: DONALD N MEYERS
Contract #:
Title: ADVANCED ARMAMENT STUB WINGS FOR MARINE ATTACK HELICOPTERS
Topic #: N90-340 Office: NASC ID #: 41471

THE OBJECTIVE IS TO DESIGN A NEW ARMAMENT STUB-WING FOR AN IMPROVED USMC AH-1W ATTACK HELICOPTER WITH TWO ADDITIONAL WEAPON STATIONS, AND SIMPLIFIED CONTROL WIRING FOR MULTIPLE WEAPONS, WHILE MINIMIZING WEIGHT AND DRAG. THE USE OF UPPER WING WEAPON STATIONS FOR SIDE-WINDER, SIDEARM, AND STINGER MISSILES WILL BE STUDIED. DESIGN OF ALTERNATE LANDING GEAR

SYSTEMS WILL ALSO BE EVALUATED. THE DESIGN WILL CONSIDER THE IMPROVEMENTS PRESENTED AS AN AH-1W BLOCK UPGRADE, AND WILL BE FULLY INTEGRATED WITH THE CURRENT AIRCRAFT AND USMC OPERATIONS. THE STUB-WING STRUTURAL DESIGNS AND MATERIAL SELECTION WILL YIELD A LIGHTER, MORE SURVIVABLE, AND HIGHER STRENGTH WING. AUXILIARY CONTROLS IN THE WING WILL BE CONSIDERED TO ENHANCE AIR COMBAT MANEUVERING. THE PRODUCTS OF THIS PROPOSAL INCLUDE WEIGHT ESTIMATES, WIRING SCHEMATICS OF THE WEAPON CONTROL HARNESS, STRUCTURAL LAYOUT, MATERIAL SELECTIONS, VEHICLE PERFORMANCE, AND A WRITTEN REPORT OF THE DESIGN STUDY CONCLUSIONS.

LAVENDER INDUSTRIES INC
8803 SHIRLEY AVE
NORTHRIDGE, CA 91324
Program Manager: SUSAN D McCALL
Contract #:
Title: FIBER OPTIC RESEARCH FOR MILITARY USES
Topic #: N90-348 Office: NASC ID #: 41494

TO MEET THE PERFORMANCE REQUIREMENTS OF SEVERAL CURRENT GENERATION AVIONICS SYSTEM UNDER DEVELOPMENT REQUIRES THE USE OF FIBER OPTIC NETWORKS. FIBER OPTIC COMPONENTS ARE READY TO MEET THE PERFORMANCE REQUIREMENTS AND THE ENVIRONMENT ASSOCIATED WITH THESE SYSTEMS, BUT SIGNIFICANT RISK REMAINS IN THE LOGISTICS AND SUPPORT POLICIES DEFINED FOR THESE SYSTEMS. FIBER OPTIC COMPONENTS HAVE NOT BEEN PROVEN TO BE MAINTAINABLE IN AN AIRCRAFT ENVIRONMENT, AND SIGNIFICANT WORK REMAINS TO DEFINE PROCEDURES AND POLICIES THAT SUPPORT THE USE OF FIBER OPTICS ON AIRCRAFT. THIS PROGRAM WILL DEFINE KEY TECHNOLOGIES AND PRODUCE GUIDELINES TO LOWER THE SUPPORTABILITY RISKS ASSOCIATED WITH AIRCRAFT FIBER OPTICS INTEGRATION. RESEARCH EFFORTS WILL ANALYZE RELIABILITY AND INTEGRITY ASPECTS OF SELECTED FIBER OPTIC COMPONENTS, AND PROVIDE INSTALLATION GUIDELINES THAT SUPPORT LONG TERM FAILURE FREE OPERATION. APPROACHES FOR TESTING FIBER OPTIC SYSTEMS ON THE FLIGHT-LINE WILL BE DEVISED, ALONG WITH METHODS FOR FAULT DETECTION, ISOLATION, AND LOCATION. REPAIR METHODS WILL BE SURVEYED AND APPROPRIATE APPROACHES SUGGESTED. THIS EFFORT WILL ALLOW APPROPRIATE METHODS, PROCEDURES, AND GUIDELINES TO BE DEVELOPED FOR SUPPORTING FIBER OPTIC COMPONENTS IN HARSH, MAINTENANCE INTENSIVE ENVIRONMENTS.

ADVANCED COUNTER-MEASURE SYSTEMS
9838 OLD PLACERVILLE RD
SACRAMENTO, CA 95827
Program Manager: WILLIAM TELLER
Contract #:
Title: BUILT-IN TET CIRCUITRY FOR FIBER OPTIC SYSTEMS
Topic #: N90-350 Office: NASC ID #: 41495

THE PROPOSED INTEGRATED SINGLE FIBER OPTIC TRANSCEIVER (ISFOT) WILL PROVIDE AVIONICS DESIGNERS WITH A PACKAGED SOLUTION FOR USING FIBER OPTICS. THE ISFOT WILL ALSO PROVIDE THE DESIGNER WITH DETAILED INFORMATION REGARDING THE STATE OF THE OPTICAL FIBER LINK, AND BIT INFORMATION TO IDENTIFY ANY INTERNAL FAILURES TO WITHIN TENS OF COMPONENTS. THIS INFORMATION WILL ALSO BE AVAILABLE IN THE LOGISTIC SUPPORT ENVIRONMENT, THUS FACILITATING MTTR AND SIMILAR STATISTICS. AS A SIDE BENEFIT, THE RECURRING COMPONENT COSTS OF AN OPTICAL LINK ARE REDUCED BY A FACTOR OF TWO (2) COMPARED TO TRADITIONAL OPTICAL LINK CONFIGURATIONS.

OPTICAL COMMUNICATIONS CORP
335 PAINT BRANCH DR

COLLEGE PARK, MD 20742
Program Manager: LOUGHREY KUHN
Contract #:
Title: AIRCRAFT BUILT-IN TEST WITH HIGHLY FAULT TOLERANT/ROBUST FIBER OPTIC VARIABLE-CHANNEL COMMUNICATION SYSTEM
Topic #: N90-350 Office: NASC ID #: 41496

FAILURE PREDICTION AND FAILURE ISOLATION IN FIBER OPTIC SYSTEMS ARE OF EXTREME IMPORTANCE IN AIRCRAFT, WHERE A DELAY OF MICROSECONDS IN CONVEYING A WARNING OF FAILURE MAY CAUSE CRITICAL LOSS. EXISTING SYSTEMS ATTEMPT TO ADDRESS THIS PROBLEM BY USING CONVENTIONAL TECHNIQUES SUCH AS ERROR CORRECTION CODING, SERIAL CONTROL INSERTIONS, BLOCK PRE- OR POST-AMBLES.... THESE APPROACHES SACRIFICE CRITICAL SPEED, RESULT IN LOSS OF MODULARITY, AND HAVE PROBLEMS OF INTERFACE COMPONENT RELIABILITY. THE RESULT IS A SIGNIFICANT LOSS IN EFFICIENCY AND INCREASE IN COST. OPTICAL COMMUNICATIONS CORPORATION (OCC) PROPOSES A FIBER OPTIC INNOVATIVE SYSTEM, ELEGANT IN ITS SIMPLICITY, SOLVING THE RELIABILITY PROBLEMS, WHILE BEING COMPLETELY COMPATIBLE WITH EXISTING STANDARDS. THE BUILT-IN-TET (BIT) CIRCUITRY OF THE PROPOSED SYSTEM ENCOMPASSES AN ERROR DETECTION CODE OVERLAYING EACH BIT, AND IT HAS AN ABILITY TO DELIVER SELF-TEST INFORMATION QUICKLY TO THE NEXT CHANNE IN-BAND. THE BIT ERROR RATE (BER) OF THE SYSTEM IS REDUCED SIGNIFICANTLY. ADDITIONALLY, THE SYSTEM CAN OVERCOME A CATASTROPHIC FAILURE WITHOUT BECOMING INOPERATIVE, AND USERS AT THE FAR END CAN BE NOTIFIED CONCURRENTLY WITH RECEIPT OF THE DATA ITSELF.

TECHNO-SCIENCES INC
7833 WALKER DR - STE 620
GREENBELT, MD 20770
Program Manager: WILLIAM H BENNETT
Contract #:
Title: ALGORITHM DEVELOPMENT FOR WEAPONS SYSTEM ALLOCATION
Topic #: N90-351 Office: NASC ID #: 41497

WE PROPOSE A SYSTEMATIC INVESTIGATION OF ADVANCED MODELING AND STOCHASTIC CONTROL AND SCHEDULING METHODOLOGIES FOR ASPECTS OF WEAPONS ALLOCATION PROBLEMS - SEVERAL PLATFORMS WITH ASSETS OF DIFFERENT CHARACTER DEFENDING AGAINST A DIVERSE COLLECTION OF TARGETS. WE ARGUE THAT THE MODELS FOR SUCH SCENARIOS LEAD TO STOCHASTIC SCHEDULING PROBLEMS WHICH CAN NOT BE HANDLED BY CONVENTIONAL ANALYTICAL METHODS; AND WE DISCUSS SEVERAL DIFFERENT ANALYTICAL APPROACHES WHICH HAVE THE POTENTIAL FOR SYNTHESIS OF EFFECTIVE ENGAGEMENT ALGORITHMS.

EIDETICS INTERNATIONAL INC
3415 LOMITA BLVD
TORRANCE, CA 90505
Program Manager: T TERRY NG
Contract #:
Title: DYNAMIC LIFT ENHANCEMENT USING OSCILLATING LEADING- AND TRAILING-EDGE WING FLAPS
Topic #: N90-356 Office: NASC ID #: 41499

THE MAIN INTEREST OF THIS RESEARCH EFFORT FOCUSES ON THE LIFT- OVERSHOOT PHENOMENON FOR STRAIGHT AND MODERATELY SWEPT WINGS. ONE PRACTICAL PROBLEM WHEN ONE WANTS TO UTILIZE THE DYNAMIC LIFT AS A MEANS TO ENHANCE AIRCRAFT PERFORMANCE IS THAT THE LIFT-OVERSHOOT IS USUALLY TOO SHORT-LIVED TO BE OF USAGE. A METHOD TO ENHANCE AND PROLONG THE DYNAMIC LIFT BY COORDINATED, SMALL-AMPLITUDE MOVEMENTS OF THE LEADING AND TRAILING EDGE FLAPS IS PROPOSED. OSCILLATION OF THE LEADING EDGE FLAP IS USED TO REDISTRIBUTE THE VORTICITY WHICH NORMALLY GOES INTO A SINGLE STRONG STALL-VORTEX AT THE END OF A PITCH-UP MOTION INTO

SMALLER AND WEAKER VORTICES DURING THE COURSE OF THE WING MOTION. COMPARED WITH THE CASE WITH NO FLAP MOTION, THE RESULTING SMALLER LEADING EDGE VORTEX AT THE END OF THE PITCH-UP MOTION WILL TAKE A LONGER TIME TO GROW TO THE CRITICAL STRENGTH FOR DYNAMIC STALL TO OCCUR AND THUS THE ONSET OF STALL IS DELAYED. A COORDINATED OSCILLATION OF THE TRAILING FLAP CAN RESULT IN AN EFFECTIVE CAMBER CHANGE WHICH DELAYS THE CONVECTION OF THESE VORTICES DOWN THE WING SURFACE AND FURTHER INCREASES THE DURATION OF DYNAMIC LIFT ENHANCEMENT. THE GOAL OF THE RESEARCH PROGRAM IS TO DEVELOP AND DEFINE A DYNAMIC FLAP OSCILLATION METHODOLOGY FOR CONTROLLING AND DELAYING WING STALL DURING DYNAMIC SITUATIONS.

SCIENTIFIC RESEARCH ASSOCS INC
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
Program Manager: DR W ROGER BRILEY
Contract #:
Title: DYNAMIC LIFT ANALYSIS
Topic #: N90-356 Office: NASC ID #: 41498

AN INNOVATIVE APPROACH IS PROPOSED IN APPLYING STATE-OF-THE-ART NUMERICAL MODELLING TO THE IMPORTANT PROBLEM OF DYNAMIC LIFT ANALYSIS. UNDER THIS APPROACH AN EVALUATION OF POSSIBLE ALGORITHMS WOULD BE MADE AND THAT ALGORITHM MOST ADVANTAGEOUS TO THE DIFFICULT DYNAMIC LIFE SIMULATION WOULD BE CHOSEN FOR INCORPORATION INTO AN EXISTING NAVIER-STOKES CODE. SIMILARLY, TURBULENCE/TRANSITION MODELS WOULD BE REVIEWED AND THAT MOST APPROPRIATE WOULD BE INCORPORATED INTO THE CODE. THE CODE WOULD BE COMBINED WITH A USER-FRIENDLY WORKSTATION-BASED PROTOCOL TO ALLOW EASY USE BY THOSE NOT EXPERT IN CFD. UNDER THE PHASE I EFFORT, NUMERICAL METHODS AND TURBULENCE/TRANSITION MODELS WOULD BE ASSESSED AND A DEMONSTRATION CASE WOULD BE RUN. THE PHASE II EFFORT CONVERT THE RESEARCH CODE INTO A DESIGN CODE AND DEMONSTRATE THE CAPABILITY THROUGH A SERIES OF SIMULATIONS FOR SUGGESTED FLOW CONTROL TECHNIQUES.

REINHART & ASSOCS INC
PO BOX 9802-173
AUSTIN, TX 78766
Program Manager: DR TEODORO LEON-SALAMANCA
Contract #:
Title: SURFACE RESIDUAL STRESS ANALYSIS OF METALS AND ALLOYS
Topic #: N90-358 Office: NASC ID #: 41500

PREDICTION OF CATASTROPHIC AND COSTLY FAILURE IN STRUCTURAL COMPONENTS HAS BEEN HAMPERED BY THE INABILITY TO MEASURE STRESS LEVELS IN CRITICAL COMPONENTS WITH ACCURACY. THIS PROPOSAL DESCRIBES THE STEPS NEEDED TO DETERMINE THE FEASIBILITY TO DEVELOP A STRESS MEASUREMENT SYSTEM THAT RELIES ON ULTRASONIC (ACOUSTO- ELASTIC) WAVE MEASUREMENTS. THE RECENT ADVANCEMENTS MADE IN THE USE OF CRITICAL REFRACTED LONGITUDINAL WAVES (CRLW), COUPLED WITH THE EXPANSION OF COMPUTER-ASSISTED ULTRASONIC DETECTION SYSTEMS, HAVE GIVEN IMPETUS TO THIS PROPOSAL. THIS STUDY INVOLVES THE ANALYSIS OF THE CRLW PHENOMENA, TO MEASURE RESIDUAL STRESS AT THE SURFACE AND INTERIOR OF A PART OR STRUCTURE, EXPERIMENTAL VERIFICATION OF FUNDAMENTAL PREMISES, AND THE DEVELOPMENT OF A DESIGN SPECIFICATION FOR A STRESS ANALYSIS SYSTEM.

ADVANCED TECHNOLOGY MATERIALS INC
520-B DANBURY RD
NEW MILFORD, CT 06776

Program Manager: PETER VanBUSKIRK
Contract #:
Title: NONLINEAR POLYMER ETALON FOR HIGH RESOLUTION OPTICAL COMPUTING
Topic #: N90-362 Office: NSWC ID #: 41501

THE USE OF OPTICAL SYSTEMS IN HIGH SPEED SIGNAL PROCESSING APPLICATIONS IS DESTINED BECAUSE OF THE OVERWHELMING ADVANTAGES OF PARALLEL DATA TRANSMISSION. MANY APPLICATIONS REQUIRE NONLINEAR TRANSFORMATIONS TO BE PERFORMED IN PARALLEL AT HIGH SPEED AND RESOLUTION. THE USE OF ORGANIC MATERIALS WITH LARGE OPTICAL NONLINEARITIES IS PARTICULARLY ATTRACTIVE BECAUSE OF THEIR FAST RESPONSE, BROADBAND TRANSPARENCY IN THE NEAR INFRARED AND THE COMPATIBILITY WITH Si VLSI FABRICATION TECHNOLOGY. HOWEVER, HIGH SPATIAL RESOLUTION IS IMPOSSIBLE IF WAVEGUIDES ARE USED TO ACHIEVE THE REQUIRED OPTICAL THICKNESS. IN CONTRAST, HIGH LEVELS OF INTEGRATION CAN BE ACHIEVED WITH LIGHT AT NORMAL INCIDENCE IF HIGH FINESSE RESONATORS FILLED WITH NONLINER POLYMERS CAN BE DEVELOPED. THIS DEVICE STRUCTURE GIVES SUFFICIENT ENHANCEMENT OF THE OPTICAL FIELDS INSIDE THE NONLINEAR CAVITY TO ACHIEVE SUFFICIENT OPTICAL THICKNESS WITH 2 MICROMETER POLYMER FILMS. THE OBJECT OF PHASE I IS TO FABRICATE NOVEL, INTEGRATED, THIN-FILM, NONLINEAR FABRY-PEROT ETALONS WHICH DISPLAY NONLINEAR TRANSMITTANCE CHARACTERISTICS AT mW POWER LEVELS. PHASE II WILL FOCUS ON REFINING THE ETALON DESIGN TO OBTAIN QUANTITATIVE AGREEMENT WITH DESIRED LOGARITHMIC RESPONSE AND EXTENDING THE FABRICATION TECHNOLOGY TO PERMIT THE LARGE SCALE INTEGRATION OF THE DISCRETE DEVICES.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02154
Program Manager: DR LAWRENCE H DOMASH
Contract #:
Title: NEW ORGANIC PHOTOREFRACTIVE NONLINEAR OPTICAL MATERIALS
Topic #: N90-362 Office: NSWC ID #: 41502

MANY OF THE MOST DRAMATIC AND POTENTIALLY USEFUL PHENOMENA OF NONLINEAR OPTICS – INCLUDING OPTICAL PHASE CONJUGATION, NEURAL NETWORK OPTICAL COMPUTING, AND REAL-TIME HOLOGRAPHY – HAVE BEEN DISCOVERED USING PHOTOREFRACTIVE CRYSTALS AT LOW CW LASER POWERS. UNFORTUNATELY, EXISTING INORGANIC PHOTOREFRACTIVE MATERIALS SUCH AS BARIUM TITANATE ARE FAR TOO SLOW, TOO TEMPERATURE-SENSITIVE, AND TOO DIFFICULT TO PRODUCE FOR USE IN PRACTICAL SYSTEMS. ORGANIC AND POLYMERIC SUBSTANCES HAVE EMERGED AS IMPORTANT SECOND AND THIRD ORDER NONLINEAR OPTICAL MATERIALS, BUT TO DATE NO ORGANIC PHOTOREFRACTIVES HAVE BEEN FOUND. PHASE I RESEARCH IS DIRECTED AT DISCOVERING AN ENTIRELY NEW CLASS OF ORGANIC PHOTOREFRACTIVES, WHICH PROMISE TO BE MUCH FASTER, CHEAPER AND EASIER TO PROCESS INTO A VARIETY OF FORMS. THE KEY PROBLEM OF COMBINING PHOTOCONDUCTIVE AND ELECTRO-OPTIC EFFECTS IN A SINGLE MATERIAL WILL BE APPROACHED VIA A NUMBER OF ALTERNATIVE RESEARCH PATHS. THE RESEARCH PROGRAM INVOLVES A COMBINATION OF EXPERIMENTAL TRIALS OF FOUR INITIAL CONCEPTS AND FOCUSED THEORETICAL EFFORTS. A MULTIDISCIPLINARY TEAM OF INDUSTRIAL AND ACADEMIC SCIENTISTS HAS BEEN ORGANIZED TO ADDRESS THIS HIGHLY CHALLENGING TECHNICAL PROBLEM.

LINDSEY ASSOCS
R.R. 1 - BOX 302A-1
CARBONDALE, IL 62901
Program Manager: JEFFERSON F LINDSEY
Contract #:
Title: POLARIZATION INSENSITIVIE RADOMES FOR HIGH SPEED MISSILES
Topic #: N90-363 Office: NSWC ID #: 41503

FOUR DESIGN TECHNIQUES WILL BE EVALUATED AND RADOME MATERIALS WILL BE SELECTED TO OBTAIN DESIGNS FOR POLARIZATION INSENSITIVITY RADOMES FOR HIGH SPEED MISSILE APPLICATIONS. THE FOUR TECHNIQUES WILL INCLUDE THE DIELECTRIC RING/STRIP, WIRE GRID, ANISTROPIC PATCH AND ANISTROPIC FABRIC METHODS. COMPUTER ANALYSIS AND LIMITED FLAT PANEL TESTING WILL BE PERFORMED TO DEMONSTRATE THE FEASIBILITY OF THE DESIGNS SELECTED. THE PRINCIPAL INVESTIGATOR'S EXTENSIVE EXPERIENCE IN THE AREAS OF COMPUTER MODELING, MATERIAL EVALUATION AND TESTING WILL ENSURE PRACTICAL AND USABLE RESULTS FROM PHASE I.

PROCESSING RESEARCH INC
8027 LEESBURG PIKE - STE 201
VIENNA, VA 22182
Program Manager: CLARENCE H STEWART
Contract #:
Title: SIGNAL PROCESSING FOR ANTI-RADIATION MISSILE RECEIVERS
Topic #: N90-364 Office: NSWC ID #: 41504

MODERN ANTI-RADIATION MISSILES FACE AN INCREASINGLY COMPLEX TARGET SIGNAL ENVIRONMENT WHICH, IN ITS TOTAL SCOPE, INCLUDES ACTIVE ELECTRONIC COUNTERMEASURES SUCH AS ADVANCED WAVEFORMS, LOW SPECTRAL POWER DENSITY, AND INTEGRATION INTO A TACTICAL (OR STRATEGIC) AIR DEFENSE SYSTEM SUCH THAT THE WEAPONS ASSOCIATED RADARS MINIMIZE "UPTIME." EFFECTIVE INTEGRATION OF AN AIR DEFENSE SYSTEM ALLOWS THE FIRE CONTROL RADARS TO REMAIN OFF THE AIR, EXCEPT DURING ACTUAL MISSILE FLYOUT, HAVING BEEN PASSED THE NECESSARY TARGET LOCATION/ TRACK DATA FROM OTHER ASSETS WITHIN THE TOTAL AIR DEFENSE SYSTEM. A FUNDAMENTAL ENHANCEMENT TO BE PROVIDED FOR THE ANTI-RADIATION MISSILE RECEIVING SEGMENT IS A SIGNIFICANT INCREASE IN SENSITIVITY IN ORDER TO DETECT TARGET ANTENNA SIDELOBES OF ALL ORDERS (INCLUDING BACKLOBES). IDEALLY, ENHANCEMENT OF ARM RECEIVER SENSITIVITY CAN BE EFFECTED BY A SIMPLE RETROFIT OF EXISTING SYSTEMS, THUS RECOVERING THE VERY SIGNIFICANT "SUNK COST" IN EXISTING MISSILES. PROCESSING RESEARCH INCORPORATED (PRI) HAS PROPOSED A SENSITIVITY ENHANCEMENT TECHNIQUE BASED UPON A UNIQUE (PATENTS PENDING) APPROACH BASED ON ITS PROPRIETARY CORRELATION PHASE DETECTOR TECHNIQUE THAT IS DIRECTLY USABLE AS A SIMPLE, LOW COST RETROFIT OF EXISTING MISSILE SYSTEMS AND CAN ALSO PROVIDE EQUIVALENT PERFORMANCE ENHANCEMENT FOR ADVANCED ARM RECEIVER SYSTEMS DESIGNED TO COUNTER OTHER TARGET ATTRIBUTES SUCH AS ADVANCED WAVEFORMS AND MULTIPLE OR EXPANDED FREQUENCY USAGE. IN MANY CASES, DIRECT SUBSTITUTION OF THE PRI COHERENT PROCESSOR FOR THE EXISTING PHASE DETECTOR/INTEGRATOR CIRCUIT ELEMENT CAN RESULT IN OVER 1,000:1 IMPROVEMENT IN ARM RECEIVER SENSITIVITY. FULL REALIZATION OF ANGULAR ACCURACY IMPROVEMENTS AFFORDED BY A CORRELATION PROCESSOR WILL REQUIRE INCREASING THE ARM RECEIVER ANTENNA PAIR SPACING.

SYNETICS CORP
540 EDGEWATER DR
WAKEFIELD, MA 01880
Program Manager: RICHARD W HELDT
Contract #:
Title: HIGH EFFICIENCY ADA COMPILER
Topic #: N90-365 Office: NSSC ID #: 41531

THIS PROJECT WILL INVESTIGATE THE FEASIBILITY OF DEVELOPING AN ADA COMPILER WHOSE OBJECT CODE IS BASED ON THE FORTH PROGRAMMING SYSTEM. THE PRINCIPAL ELEMENTS OF THE RUN-TIME SYSTEM WOULD INCLUDE THE USE OF THREADED CODE, A DUAL-STACK ARCHITECTURE, AND A TIGHTLY-COUPLED SET OF OPERATORS TO PERFORM BOTH SYSTEM AND APPLICATION FUNCTIONS. SUCH A COMPILER WOULD BE CAPABLE OF SUPPORTING EMBEDDED SYSTEMS WITH USEFUL CAPABILITY BY GENERATING SMALL, EFFICIENT EXECUTABLE IMAGES IN THE RANGE OF 16-64 KILOBYTES FOR THE COMPLETE SOFTWARE SYSTEM. MOREOVER, THE COMPILER WOULD BE EASILY ADAPTED TO GENERATE

CODE FOR A NUMBER OF 8-16BIT MICROPROCESSORS.

UNIXPROS INC
16 BIRCH LN
COLTS NECK, NJ 07722
Program Manager: ARVIND GOEL
Contract #:
Title: HIGH EFFICIENCY ADA COMPILER
Topic #: N90-365 Office: NSSC ID #: 41532

MOST OF THE CURRENT ADA COMPILER IMPLEMENTATIONS DO NOT ALLOW THE DEVELOPMENT OF EMBEDDED SYSTEMS SOFTWARE DUE TO A VERY LARGE OVERHEAD IN TERMS OF OPERATING SPEED AND MEMORY REQUIREMENTS. THE PHASE I PROPOSAL WILL COME UP WITH THE DESIGN OF A HIGH EFFICIENCY ADA COMPILER THAT WOULD EXECUTE WITH MINIMAL PERFORMANCE DEGRADATION AND MEMORY REQUIREMENTS, IN THE RANGE OF 16K TO 64K BYTES FOR THE TOTAL SYSTEM, APPLICATION AND OVERHEAD. THE FOLLOWING AREAS ARE OF MAJOR CONCERN WHEN DESIGNING A HIGH EFFICIENCY ADA COMPILER a) DESIGN OF THE ADA RUNTIME SYSTE, b) OPTIMIZATIONS AND CODE GENERATION ALGORITHMS, c) SIZE OF THE ADA RUNTIME SYSTEM AND SELECTIVE LINKING OF THE OBJECT CODE. TECHNIQUES FOR IMPLEMENTING ADA FEATURES SUCH AS TASKING, INTERRUPTS, EXCEPTIONS, MEMORY MANAGEMENT, INPUT/OUTPUT ETC. WILL BE EXPLORED SO AS TO MINIMIZE EXECUTION TIME AND MEMORY USAGE. NEW GLOBAL OPTIMIZATION TECHNIQUES AND CODE GENERATION ALGORITHMS WILL BE RESEARCHED. THESE ALGORITHMS GREATLY IMPROVE THE POTENTIAL FOR PRODUCING HIGH EFFICIENCY ADA COMPILERS. EXPERIMENTS WILL BE PERFORMED TO DETERMINE THE FEASIBILITY OF THE DIFFERENT TECHNIQUES USING AN ADA COMPILER SYSTEM TARGETED TO A BARE MACHINE.

ELECTROMAGNETIC APPLICATIONS INC (EMA)
64 SUMNER ST
NEWTON, MA 02159
Program Manager: HOTON HOW
Contract #:
Title: AMPLIFYING FERROMAGNETIC ECHOING DEVICES
Topic #: N90-366 Office: NWC ID #: 41535

AMPLIFYING FERROMAGNETIC DEVICE (AFED) OPERATING AT 800-900 MHz IS NEEDED FOR ELECTRONIC APPLICATIONS. THE OBJECTIVE OF THIS PHASE I IS TO PROVIDE A PRACTICAL DESIGN FOR AN AFED AND RELIABLY PREDICT ITS PERFORMANCE. IN ADDITION, AN ALTERNATIVE DESIGN OF AN AFED IS PROPOSED FOR MMIC APPLICATIONS AT 800 MHz OR HIGHER FREQUENCIES.

FLAM & RUSSELL INC
PO BOX 999 - 506 PRUDENTIAL RD
HORSHAM, PA 19044
Program Manager: JOHN F AUBIN
Contract #:
Title: DEVELOPMENT OF MOBILE SURFACE CLUTTER MAPPER
Topic #: N90-368 Office: NWC ID #: 41537

THE CHARACTERIZATION OF CLUTTER IS CRITICAL TO THE DESIGN, DEVELOPMENT, AND TEST OF MODERN MILITARY SEEKER AND RADAR SYSTEMS. THE NATURE OF CLUTTER IS SUCH THAT IT CAN BE CHARACTERIZED ANALYTICALLY ONLY ON A GENERALIZED BASIS; THIS IS OFTEN INADEQUATE TO USE IN THE ASSESSMENT OF SYSTEM PERFORMANCE AND THE DESIGN OF TESTS. THEREFORE, A SYSTEM CAPABLE OF MAPPING THE CLUTTER SCENE AT SPECIFIC SITES WOULD BE A VALUABLE TOOL FOR

MILITARY SYSTEMS DEVELOPMENT. IN ORDER TO OBTAIN MAXIMUM UTILITY OF THE SYSTEM, IT SHOULD BE FULLY MOBILE AND CAPABLE OF CHARACTERIZING A WIDE DYNAMIC RANGE OF CLUTTER SOURCES. THE POLARIZATION DIVERSE SYSTEM DESCRIBED IS TAILORED FOR THE APPLICATION OF EXISTING HARDWARE COMPLEMENTS, AND UTILIZES THE PRINCIPLES OF SYNTHETIC APERTURE RADAR FOR IMPLEMENTATION OF THE MAPPING. A CALIBRATION ALGORITHM FOR THE SYSTEM IS DESCRIBED. THE SYSTEM IS CONFIGURED FOR STRAIGHTFORWARD IMPLEMENTATION OF ADDITIONAL FREQUENCY BANDS.

CENTER FOR REMOTE SENSING
PO BOX 9244
McLEAN, VA 22102
Program Manager: SUMAN GANGULY
Contract #:
Title: MODELING OF RADOMES SHIELDING SPIRAL ANTENNAS
Topic #: N90-369 Office: NWC ID #: 41538

FINITE ELEMENT CODE WILL BE DEVELOPED FOR ELECTROMAGNETIC SCATTERING FROM RADOMES. GENERAL PURPOSE FINITE DIFFERENCE AND FINITE ELEMENT TECHNIQUES FOR ANALYZING ARBITRARY-SHAPED AND INHOMOGENEOUS BODIES OF REVOLUTION HAVE RECENTLY BEEN DEVELOPED BY MITTRA AND HIS CO- WORKERS. THESE WILL BE ADAPTED FOR THE SPECIFIC SITUATION WHERE THE CLOSE PROXIMITY OF THE RADOME WILL BE TAKEN INTO ACCOUNT. THE RESULTANT CODE WILL BE COMPUTATIONALLY EFFICIENT AND WILL BE USEFUL FOR THE DESIGN OF RADOMES. THE ABOVE CODE WILL BE USED IN CONJUNCTION WITH NEC TO MODEL THE COMBINATION OF SPIRAL ANTENNA AND RADOME. THE RESULTS WILL BE COMPARED WITH EXPERIMENTAL MEASUREMENTS WHICH WILL BE UNDERTAKEN DURING PHASE II OF THIS EFFORT.

FROST ENGINEERING DEVELOPMENT CORP
PO BOX 1294 - 3900 S KALAMATH ST
ENGLEWOOD, CO 80150
Program Manager: HORACE M VARNER
Contract #:
Title: PARACHUTE OPENING SHOCK LOAD LIMITING SYSTEM
Topic #: N90-370 Office: NWC ID #: 41539

THERE IS A NEED TO SHAPE THE OPENING SHOCK FORCE-TIME PULSE OF A PERSONNEL PARACHUTE IN ORDER TO OBTAIN MAXIMUM DECELERATION WITH A MINIMUM PROBABILITY OF INJURY TO AN EJECTEE. ANALYSIS OF THE BIODYNAMICS OF PARACHUTE OPENING WILL BE USED TO ESTABLISH A MAXIMUM TOLERABLE DECELERATION. DESIGN CRITERIA INCLUDING THE NEEDED STROKE AND FORCE-DISPLACEMENT CURVE WILL BE DEVELOPED. TWO METHODS OF LOAD LIMITING WILL BE STUDIED. ONE INVOLVES THE USE OF DEVICES WITH CONTROLLED STROKE TO ACT AS ENERGY ABSORBERS. THE SECOND PERMITS CONTROLLED DIS-REEFING OF THE PERSONNEL PARACHUTE BASED UPON THE FORCE EXERTED ON THE RISERS. THE TWO METHODS WILL BE STUDIED AND COMPARED. TESTS WILL BE CONDUCTED ON DEVELOPMENTAL HARDWARE, AND THE RESULTS INCORPORATED INTO ANALYTICAL STUDIES. A RECOMMENDATION FOR A PREFERRED LOAD LIMITING SYSTEM WILL BE PROVIDED AT THE END OF THE PROGRAM.

SYSTEMS TECHNOLOGY INC
13766 S HAWTHORNE BLVD
HAWTHORNE, CA 90250
Program Manager: JAMES C SMITH
Contract #:
Title: ADAPTIVE NEURAL NETWORK ARCHITECTURE FOR ROBUST RECONFIGURABLE FLIGHT CONTROL

Topic #: N90-372 Office: NWC ID #: 41551

THE PROPOSED WORK ADDRESSES SPECIFIC ISSUES RELATED TO AIRCRAFT STABILITY DURING CONFIGURATION CHANGES, DAMAGE CONTROL AND CONFIGURATION MANAGEMENT WHICH HAVE RECEIVED INCOMPLETE TREATMENT IN EXISTING AIRCRAFT FLIGHT CONTROLLER SYSTEMS DESIGN. THE APPROACH WE HAVE SELECTED UTILIZES NEURAL NET TECHNOLOGY TO IDENTIFY AND COMPENSATE FOR ADVERSE DYNAMICS WHICH CAN BE ENCOUNTERED DURING OPERATIONAL CONFIGURATION CHANGES CONSEQUENT TO (1) DAMAGE CONTROL, (2) MISSION PROFILE SEGMENT TRANSITION OR (3) TACTICAL MODE CHANGE. ADVANCED SIMULATION TECHNIQUES WILL BE EMPLOYED TO EVALUATE THE POTENTIAL OF SEVERAL ALTERNATIVE NEURAL NET ARCHITECTURES IN IDENTIFICATION AND CONTROL OF ADVERSE PLANT CHARACTERISTICS RESULTING FROM CONFIGURATION CHANGE. EXPERIMENTAL RESULTS WILL BE USED TO SPECIFY A DESIGN STRATEGY FOR A RECONFIGURATION MANAGER WHICH IS SENSITIVE TO MISSION OBJECTIVES AND SITUATIONAL VARIABLES WHILE MAXIMIZING AIRCRAFT PERFORMANCE AND SAFETY DURING RECONFIGURATION.

MASSA PRODUCTS CORP
280 LINCOLN ST
HINGHAM, MA 02043
Program Manager: STEPHEN C BUTLER
Contract #:
Title: MINIATURIZED METALLIC GLASS ACCELEROMETER
Topic #: N90-373 Office: NWC ID #: 41552

THIS HIGHLY ACTIVE METALLIC GLASS (METGLAS) MATERIAL HAS FEATURES WHICH MAKE IT ATTRACTIVE AS A TRANSDUCTION MECHANISM FOR ACCELEROMETERS AND DIRECTIONAL HYDROPHONES. UNDER PHASE 1, A SINGLE-CHANNEL MINIATURIZED ACCELEROMETER PROTOTYPE WITH EXTENDED LOW-FREQUENCY CAPABILITY WILL BE DEVELOPED, FABRICATED AND EVALUATED, UTILIZING METALLIC GLASS AS THE TRANSDUCTION MATERIAL. THE SENSING OF MOTION IS ACHIEVED THROUGH LARGE CHANGES IN THE PERMEABILITY OF THE MATERIAL AS A RESULT OF SMALL OPPOSITE STRAINS ON TWO SURFACES OF A CANTILEVER STRUCTURE. THIS CHANGE IN PERMEABILITY CAUSES A CORRESPONDING CHANGE IN THE VOLTAGE OF THE SURROUNDING COIL WHEN THE SYSTEM IS BIASED BY AN ADDITIONAL AC CARRIER MAGNETIC FIELD.

DELTA INFORMATION SYSTEMS INC
300 WELSH RD - BLDG 3
HORSHAM, PA 19044
Program Manager: ALAN R DEUTERMANN
Contract #:
Title: ELECTRONIC OPTICAL VECTOR SCORING SYSTEM
Topic #: N90-374 Office: PMTC ID #: 41553

THIS DOCUMENT IS A TECHNICAL PROPOSAL TO DEVELOP AN ELECTRONIC OPTICAL VECTOR SCORING SYSTEM (EOVSS) FOR ACCURATELY MEASURING THE TRAJECTORY OF A MISSILE, RELATIVE TO A TARGET DURING THE FINAL PHASE OF A MISSILE ATTACK ON A TARGET. THE PROPOSED EOVSS SYSTEM EMPLOYS MULTIPLE TV CAMERAS ON THE TARGET AIRCRAFT. AN AIRBORNE VIDEO SYSTEM AUTOMATICALLY SELECTS THAT CAMERA(S) VIEWING AND ATTACKING MISSILE(S) AND COMPRESSES THE SIGNAL FOR NARROWBAND DIGITAL TRANSMISSION. A CROUND-BASED VIDEO SYSTEM COMPUTE THE MISS DISTANCE FOR THE END-GAME SCENARIO. IT IS PROPOSED TO ANALYZE THE SYSTEM REQUIREMENTS, DESIGN THE AIRBORNE AND GROUND SUBSYSTEMS, ANALYZE THE RISKS FOR SYSTEMS DEVELOPMENT, AND DEVELOP THE LIMITS OF SYSTEM PERFORMANCE.

HOPKINS IMAGING SYSTEMS

3827 E COLORADO BLVD
PASADENA, CA 91107
Program Manager: RICHARD HOPKINS
Contract #:
Title: TEXTURE MODELING TECHNIQUES FOR SIMULATION OF INFRARED SENSOR DISPLAYS FOR MISSION PRACTICE IN NIGHT/LOW VISIBILITY CONDITIONS
Topic #: N90-375 Office: NTSC ID #: 41554

CURRENT METHODS FOR SIMULATING INFRARED (IR) SENSOR DISPLAYS USE A COMPLEX DATABASE THAT REQUIRES LARGE AMOUNTS OF OFF-LINE PROCESSING TO CREATE THE DATABASE, WHILE PRODUCING LOW FIDELITY REAL-TIME IMAGES. THE CURRENT METHOD FOR CREATING A SIMULATED IR DATABASE STARTS WITH A DETAILED 3D MODEL FOR THE TERRAIN AND OBJECTS ON THE TERRAIN, THEN CALCULATES THE SURFACE TEMPERATURES BY SOLVING A SET OF DIFFERENTIAL EQUATIONS FOR EACH SURFACE. ALTERNATIVE METHODS FOR CREATING THE SIMULATED IR DATABASE WILL BE EXPLORED. THESE METHODS WILL USE TEXTURE TO REDUCE THE NUMBER OF POLYGONS THAT THE REAL-TIME IMAGE GENERATOR WILL PROCESS, WHILE INCREASING THE VISUAL COMPLEXITY OF THE SIMULATED SENSOR'S IMAGE. THE METHODS WILL ALSO REDUCE THE COST TO CREATE THE SIMULATED IR DATABASE.

AERO-VIRONMENT INC
PO BOX 5031
MONROVIA, CA 91017
Program Manager: DR P B S LISSAMAN
Contract #:
Title: UAV PASSIVE PROPELLER LOAD CONTROL
Topic #: N90-376 Office: NAPC ID #: 41654

THERE IS A NEED TO IMPROVE THE EFFICIENCY OF PROPELLERS FOR EXISTING AND FUTURE UAV SYSTEMS. PROPELLER PITCH CONTROL PROVIDES A VERY EFFECTIVE MEANS OF ACHIEVING GOOD PERFORMANCE OVER A WIDE RANGE OF FLIGHT CONDITIONS AND IS THE METHOD UTILIZED BY CONVENTIONAL ACTIVE SYSTEMS. FOR LIGHTWEIGHT UAV APPLICATIONS, SEMI-AUTOMATIC OR PASSIVE SYSTEMS ARE POSSIBLE AND VERY BENEFICIAL. THE ADVANTAGES OF A PASSIVE SYSTEM ARE IN ITS POTENTIAL FOR INCREASING THE PERFORMANCE OF UAVs WITH MINIMUM IMPACT ON EXISTING PROPULSION SYSTEMS FOR LESS WEIGHT AND COMPLEXITY THAN CONVENTIONAL COMMERCIAL AND MILITARY. A SIMPLE AND EFFECTIVE PASSIVE PITCH CONTROL USING A BEAM-TORQUE MEMBER MOUNTED WITHIN THE BLADE STRUCTURE AND ATTACHED TO THE BLADE AT A STATION AT ABOUT HALF THE PROPELLER RADIUS IS DESCRIBED. THIS STRUCTURAL PROCEDURE IS NOT POSSIBLE ON CONVENTIONAL AIRCRAFT PROPELLERS, BUT THE SMALLER SCALE AND POWER OUTPUT OF THE UAV MAKE IT ACCEPTABLE IN THIS CASE. A FOUR TASK PROJECT IS DESCRIBED INVOLVING DESIGN REQUIREMENTS IN TASK 1, DEVELOPING A COMPUTER DESIGN METHOD FOR THE BLADE PITCH DYNAMICS IN TASK 2, EXERCISING THE METHOD IN TASK 3 TO DESIGN A SPECIFIC PASSIVE PITCH PROPELLER, THEN EVALUATE AND DOCUMENT IN TASK 4.

DAEDALUS RESEARCH INC
1533 SUMAC DR
LOGAN, UT 84321
Program Manager: EDWARD H ALLEN
Contract #:
Title: FEASIBILITY OF PROPELLER LOAD CONTROL STRATEGIES UTILIZING PIEZOCERAMIC DRIVERS
Topic #: N90-376 Office: NAPC ID #: 41704

CONTRACTOR WILL EXAMINE THE FEASIBILITY OF UTILIZING ITS PIEZOCERAMIC CHIPS AS ACTUATORS FOR VARIABLE TWIST PROPELLERS IN UAV APPLICATIONS. THESE ACTUATORS WILL BE UTILIZED TO OPTIMIZE THE TWIST OF RIB- STIFFENED ELASTOMERIC PROPELLER BLADES ON A BLADE-ELEMENT-BY-BLADE-

ELEMENT BASIS SO THAT EACH SEGMENT OF THE BLADE IS OPTIMIZED WITH RESPECT TO HELICAL INFLOW ANGLE INDEPENDENTLY OF EACH OTHER SEGMENT. THUS A BLADE-ELEMENT TUNED OPTIMUM WILL BE SOUGHT. THE LOAD ABSORBED BY THE PROPELLER IS PROPOSED TO BE VARIED ELECTRICALLY; THE PROPELLER HUB CONTAINS A BUILT-IN GENERATOR TO PROVIDE POWER TO THE SYSTEM WITHOUT COMMUTATION.

DAEDALUS RESEARCH INC
1533 SUMAC DR
LOGAN, UT 84321
Program Manager: EDWARD H ALLEN
Contract #:
Title: FEASIBILITY OF VARIOUS EROSION RESISTANCE/EROSION AVOIDANCE TECHNIQUES FOR SMALL INEXPENSIVE PROPELLERS
Topic #: N90-377 Office: NAPC ID #: 41705

CONTRACTOR WILL EXAMINE THE FEASIBILITY OF UTILIZING ITS EXISTING, BUT EXPERIMENTAL LEADING-EDGE PROTECTION SYSTEM TO PROVIDE EROSION RESISTANCE FOR INEXPENSIVE UAV PROPELLERS. THE EXISTING SYSTEM UTILIZES ELASTOMERIC URETHANES CONFIGURED TO TAKE ADVANTAGE OF THE PRINCIPLES OF THICK COATING THEORY. THE SYSTEM WILL BE THOROUGHLY TESTED, RATIONALIZED, AND DOCUMENTED; AND ITS ADAPTABILITY TO PRODUCTIONIZATION WILL BE EXAMINED. IN ADDITION, OPTIONAL EXTENSIONS OF THE EFFORT WILL PROVIDE FOR COMPARATIVE EVALUATION OF THE EXISTING SYSTEM WITH NOVEL CONCEPTS INVOLVING HARD COATINGS, AERODYNAMIC EROSION AVOIDANCE TECHNIQUES, AND ACTIVE PREVENTION SYSTEMS.

TPL INC
1549 GLORIETA NE
ALBUQUERQUE, NM 87112
Program Manager: H M STOLLER
Contract #:
Title: A HIGH ADHERENCE CERAMIC COATING FOR EROSION RESISTANT APPLICATIONS
Topic #: N90-377 Office: NAPC ID #: 41706

WOOD AND RESIN MATRIX COMPOSITE PROPELLERS FOR UNMANNED AIR VEHICLES SUFFER UNACCEPTABLE EROSION DAMAGE DUE TO LIQUID AND SOLID IMPACT. POLYMERIC PROTECTIVE COATINGS ARE INEFFECTIVE IN SOLID PARTICLE ENVIRONMENTS. THE BROAD DAMAGE AREA OF PROPELLERS MAKES METALLIC PROTECTIVE COATINGS, SUCH AS HAVE BEEN DEVELOPED FOR HELICOPTER BLADES, UNACCEPTABLE FROM A WEIGHT PENALTY. CONVENTIONAL CERAMIC COATINGS HAVE DEMONSTRATED EXCELLENT EROSION RESISTANCE, BUT HAVE BEEN ERRATIC IN PERFORMANCE, DIFFICULT TO APPLY TO COMPLEX SURFACES, AND HAVE POOR ADHERENCE PROPERTIES. A SOL-GEL-DERIVED CERAMIC COATING OFFERS TAILORABLE POROSITY CHARACTERISTICS WHICH SHOULD OPTIMIZE EROSION AND TOUGHNESS PROPERTIES. THE SOL-GEL PROCESS LENDS ITSELF TO APPLICATIONS TO COMPLEX SURFACES. A NOVEL REACTIVE PRIMER WILL COVALENTLY BOND THE CERAMIC COATING TO THE WOOD AND RESIN SUBSTRATES. SOL-GEL PROCESSING STUDIES WILL ADDRESS TAILORABILITY OF THE ALUMINA-SILICATE COMPOSITION AND MICROSTRUCTURE. PULL-OFF TESTS WILL ASSESS COATING ADHERENCE ACHIEVED BY THE REACTIVE PRIMER. DNA'S DUST EROSION FACILITY WILL BE USED TO DETERMINE SOLID IMPACT EROSION RESISTANCE AS A FUNCTION OF CERAMIC COATING CHARACTERISTICS. TPL WILL BE ASSISTED BY THE CENTER FOR MICRO-ENGINEERED CERAMICS IN COATING DEVELOPMENT AND PDA ENGINEERING IN EROSION TESTING. COMBINED, THE PROGRAM TEAM HAS COMPLETE CAPABILITIES TO ACHIEVE AN ENGINEERING SOLUTION.

ENGINE RESEARCH ASSOCS INC

2610 BOSWORTH DR
FORT WAYNE, IN 46805
Program Manager: FREDERICK L ERICKSON
Contract #:
Title: ADVANCED LIGHTWEIGHT DIESEL ENGINE
Topic #: N90-378 Office: NAPC ID #: 41725

THE PRIMARY OBJECTIVE OF THIS RESEARCH IS TO ESTABLISH A DESIGN FOR A LIGHTWEIGHT, 25 HP, DIESEL FUEL ENGINE THAT WILL PROVIDE GOOD FIELD PERFORMANCE, INCLUDING LOW TEMPERATURE STARTING. ADDITIONAL OBJECTIVES ARE TO PROVIDE A HIGH POWER-TO-WEIGHT RATION, A QUIET AND COOL EXHAUST, IMPROVE EFFICIENCY AND MULTI-FUEL OPERATION. THE PROPOSED APPROACH WILL IDENTIFY REQUIRED MODIFICATIONS TO THE MIGRATING COMBUSTION CHAMBER, FULL EXPANSION ENGINE FOR DIESEL FUEL OPERATION. THIS ENGINE USES ONLY THREE MOVING PARTS, OPERATES ON A UNIQUE, HIGHLY EFFICIENT, PATENTED, OPERATING CYCLE AND HAS A ZERO PRESSURE, QUIET AND COOL EXHAUST (WITHOUT A MUFFLER). THIS TYPE OF ENGINE HAS ALREADY DEMONSTRATED HIGH TOLERANCE TO DETONATION WITH LOW OCTANE FUELS INCLUDING N-HEPTANE. ALSO A SMALL .4 HP ENGINE OF THIS TYPE HAS OPERATED ON DIESEL AND JP-8 FUELS WITH EXCELLENT PERFORMANCE AT A STABILIZED OPERATING TEMPERATURE. THE PROGRAM WILL EVALUATE: ATOMIZATION TECHNIQUES, VARIABLE EFFECTIVE COMPRESSION RATIO, SURFACE-TO-VOLUME METHODOLOGY, AND IGNITION SOURCE. COMPUTER LAYOUT AND MODELING WILL SUPPLEMENT THE ANALYSES. A THREE VIEW ENGINE DESIGN LAYOUT WITH PROJECTED PERFORMANCE PARAMETERS WILL BE ESTABLISHED. PARTIAL HARDWARE FABRICATION AND TESTING WILL ALSO BE PERFORMED TO VERIFY THE APPROACH FOR A PHASE II FABRICATION AND TEST PROGRAM.

G S ENGINEERING & MACHINE
2817 E FOOTHILL BLVD
PASADENA, CA 91107
Program Manager: GREGORY S STEVENSON
Contract #:
Title: INNOVATIVE SMALL ENGINE CONCEPTS
Topic #: N90-378 Office: NAPC ID #: 41726

THIS PROPOSAL OUTLINES AN SBIR PHASE I ENGINE PROJECT CAPABLE OF DIESEL FUEL OPERATION AND LIGHTWEIGHT CONSTRUCTION. INHERENT SPECIFIC WEIGHT PENALTIES OF THE DIESEL CYCLE BEING INVERSELY PROPORTIONAL TO SPECIFIC DISPLACEMENT, INDICATES A SCALE REDUCTION OF THESE ENGINES DEMANDS GREATER DESIGN DISCIPLINE RELATIVE TO THE PHYSICS THAT GOVERN THEIR PERFORMANCE. THE PROPOSED APPROACH EMPLOYS A COMBINATION OF INNOVATIVE TRANSLATIONS OF ROTARY TO RECIPROCATING MOTION RESULTING IN A COMPACT DESIGN OF HIGH MECHANICAL EFFICIENCY. ADDITIONAL POWER-PRODUCING VOLUMETRIC VALVING CONTROLS SWIRL AND SCAVENGING EFFICIENCY, ENABLING HIGH BMEP LEVELS. HIGH THERMAL EFFICIENCY IS ACHIEVED BY THE INCORPORATION OF LOW SURFACE/VOLUME GEOMETRY. THE DESIGN MAKES EXTENSIVE USE OF SYNERGISM.

INERTIAL MOTORS CORP
280 N BROAD ST
DOYLESTOWN, PA 18901
Program Manager: T DANKWARD SCHMALBRUCH
Contract #:
Title: LIGHTWEIGHT REMOTELY PILOTED VEHICLE ENGINE ALTERNATOR/STARTERS
Topic #: N90-379 Office: NAPC ID #: 41728

INERTIAL MOTORS PROPOSES TO DEVELOP A LIGHTWEIGHT STARTER/GENERATOR FOR UAV/RPV USE FROM AN EXISTING HIGH TORQUE HOLLOW ROTOR MOTOR DESIGN OF 12 LBS. CURRENTLY CAPABLE OF

PROVIDING 7000 OZ-IN OF STARTING TORQUE FOR UP TO 30 SECONDS, AND GENERATING 2.52 KW OF POWER FOR > OR - 1000 HOUR LIFE, AT 28 VDC. INERTIAL MOTORS WILL CUSTOMIZE THE 4" BY 6.61" UNIT TO OPTIMIZE TOTAL WEIGHT TO APPROXIMATELY 8 LBS., ACHIEVABLE BY CONSTRUCTING THE UNIT OF LIGHTWEIGHT MATERIALS IN ALL AREAS NOT REQUIRING MAGNETIC FLUX CONDUCTANCE, AND REDESIGNING THE ROTOR TO CONTAIN SUBSTANTIALLY LESS ENCAPSULATION MATERIAL. THE ROTOR WINDING IS SELECTED TO MEET THE REQUIRED SPEED FOR THE OUTPUT POWER REQUIRED FOR THE MOST EFFICIENT POWER MATCH. THE PROPOSED STARTER/GENERATOR HAS EXTREMELY LOW INDUCTANCE AND A METALLIC CONDUCTION SILVER GRAPHITE BRUSH SYSTEM; THEREFORE, THE SYSTEM GENERATES NO EMI/RFI EMISSIONS TO IMPAIR ONBOARD. SENSOR/COMMUNICATIONS OPERATION OPTIMAL DESIGN TRADE-OFFS DURING BENCH TESTING BETWEEN REQUIRED TORQUE FOR ENGINE STARTING AND OUTPUT POWER REQUIRED FOR RPV SENSOR SYSTEMS, WILL PERMIT DESIGN TO BE OPTIMIZED FOR 3 KW OPTERATION. THE GENERATOR, CURRENTLY, CAN OUTPUT 9 KW FOR 30 SECONDS WITHOUT BURNING UP.

UNIQUE MOBILITY INC
3700 S JASON ST
ENGLEWOOD, CO 80110
Program Manager: WILLIAM M ANDERSON
Contract #:
Title: LIGHTWEIGHT STARTER/ALTERNATOR FOR SMALL ENGINES
Topic #: N90-379 Office: NAPC ID #: 41727

UNIQUE MOBILITY HAS INVENTED A NOVELMEANS OF CONSTRUCTING A BRUSHLESS DC MOTOR WHICH OPERATES WITH EFFICIENCY AND POWER RATINGS ABOVE OTHER MOTORS AVAILABLE COMMERCIALLY. THE ASSOCIATED UNIQ MOTOR AND CONTROL SYSTEM TECHNOLOGIES APPEAR TO BE IDEAL CANDIDATE FOR AN RPV ENGINE STARTER/ALTERNATOR THAT IS BOTH SMALL AND LIGHT-WEIGHT. IN THE PROPOSED PHASE I STUDY, A 3 kW ALTERNATOR AT 28 VOLTS dc OPERATING AT 4000 rpm IS DESIGNED UTILIZING COMPUTERIZED OPTIMIZATION METHODS. PRELIMINARY DESIGN RESULTS INDICATE THAT THE ALTERNATOR WOULD WEIGHT 6.3 LBS. AND THE CONTROLLER BETWEEN 4-5 LBS. THE UTILITY OF THIS DEVICE FOR SEVERAL CLASSES OV UAVs AND FOR OTHER REMOTELY OPERATED SYSTEMS IS EXPLORED. IF PROVEN FEASIBLE, THIS STARTER/ALTERNATOR COULD ENHANCE PROPULSION SYSTEM DESIGN FOR A VARIETY OF MANNED AND UNMANNED VEHICLES.

ARETE TECHNOLOGIES
15 WITHINGTON LN
HARVARD, MA 01451
Program Manager: DR STEPHEN L MATSON
Contract #:
Title: A MEMBRANE EXTRACTION PROCESS FOR SHIPBOARD RECOVERY OF JP-5 ICING INHIBITOR ADDITIVE
Topic #: N90-380 Office: NAPC ID #: 41729

WE PROPOSE TO DEVELOP A MEMBRANE-BASED EXTRATION PROCESS FOR THE RECOVERY OF ICING INHIBITOR ADDITIVE FROM WATER SEPARATED FROM JP-5 AVIATION TURBINE FUEL; THE TECHNOLOGY WILL ENABLE REBLENDING OF THE ADDITIVIE. THE NOVEL ELEMENT IN THE PROCESS CONSISTS OF A HOLLOW- FIBER CROSSFLOW MEMBRANE CONTACTOR TO WHICH AN AQUEOUS FEED SOLUTION OF ANTI-ICING AGENT AND A SUITABLE WATER-IMMISCIBLE EXTRACTION FLUID ARE SUPPLIED. THE POROUS MEMBRANES CONTAINED THEREIN PROVIDE HIGH-SURFACE-AREA CONTACT BETWEEN THE TWO IMMISCIBLE PHASES ON EITHER SIDE OF THEM AND FACILITATE EFFICIENT TRANSPORT OF THE ANTI-ICING ADDITIVE FROM THE AQUEOUS PHASE TO THE EXTRACTION FLUID; HOWEVER, DISPERSION OF THE PHASES AND THE PROBLEMS ATTENDANT THERETO ARE AVOIDE. IN A SUBSEQUENT STEP, THE EXTRACTANT IS REGENERATED AND THE ADDITIVE IS RECOVERED IN PURE FORM. THE PRINCIPAL BENEFIT OF MEMBRANE-MEDIATED EXTRACTION IN THIS APPLICATION IS THE COMPACT SIZE OF THE LIQUID/LIQUID CONTACTOR, ALTHOUGH OTHER FEATURES SUCH AS SIMPLICITY, RELIABILITY, FLEXIBILITY, AND THE

ABILITY TO OPERATE ONBOARD SHIP ARE ALSO ATTRACTIVE. IN PHASE I, WE WILL IDENTIFY, CHARACTERIZE, AND SELECT SUITABLE MEMBRANES, MEMBRANE MODULES, AND EXTRACTION FLUIDS FOR USE IN THE PROCESS, AND A BENCH-SCALE PROTOTYPE SYSTEM WILL BE BUILT AND OPERATED TO DEMONSTRATE TECHNICAL FEASIBILITY.

NEW LOGIC RESEARCH
1155 PARK AVE
EMERYVILLE, CA 94608
Program Manager: DR BRAD CULKIN
Contract #:
Title: FUEL/ICING INHIBITOR RECOVERY USING CROSSFLOW MEMBRANE SEPARATOR
Topic #: N90-380 Office: NAPC ID #: 41730

THE NAVY IS INTERESTED IN A CROSSFLOW MEMBRANE SEPARATION SYSTEM TO RECOVER FUEL IN TANK/FILTER BOTTOMS AND/OR RECOVER FUEL SYSTEM ICING INHIBITOR ADDITIVE FOR EVENTUAL REBLENDING. NEW LOGIC RESEARCH HAS DEVELOPED A NEW TECHNIQUE THAT SURPASSES CROSSFLOW SEPARATORS IN EVERY CATEGORY INCLUDING, THE PERMEATE FLUX RATE, ENERGY EFFICIENCY, SEPARATION FACTOR AND LIFETIME OF THE MEMBRANES. THE TECHNIQUE INVOLVES INDUCING HIGH INTENSITY SHEAR WAVES IN THE DIFFUSTION LIMITED BOUNDARY LAYER BY APPLYING A VIGOROUS TORSIONAL VIBRATION TO THE MEMBRANE. THIS TECHNIQUE DUBBED V*SEP(tm) (VIBRATORY SHEAR ENHANCED PROCESSING) PRODUCES SHEAR WAVES OVER 100 TIMES AS INTENSE AS ARE PRODUCED BY CROSSFLOW TECHNIQUES. THE RESULTANT DECREASE IN THE DIFFUSION LIMITED BOUNDARY LAYER ALLOWS A V*SEP SEPARATOR TO MAKE SEPARATIONS THAT ARE UNECONOMICAL OR IMPOSSIBLE TO MAKE WITH CROSSFLOW HOLLOW FIBER UNITS. NEW LOGIC RESEARCH PROPOSES TO TEST ITS PROTOTYPE V*SEP SYSTEM WITH VARIOUS MEMBRANES TO DETERMINE THE BEST PERFORMANCE FOR ICING INHIBITOR ADDITIVE SEPARATION.

ELECTROCHIMICA CORP
20 KELLY CT
MENLO PARK, CA 94025
Program Manager: DR MORRIS EISENBERG
Contract #:
Title: HIGH ENERGY LONG LIFE BATTERY R&D
Topic #: N90-381 Office: NAPC ID #: 41732

THE NAVY HAS A NEED FOR RECHARGEABLE BATTERIES WITH ENERGY DENSITIES FAR SUPERIOR TO THOSE OF ORDINARY LITHIUM SYSTEMS FOR POTENTIAL USE IN UNMANNED AIR VEHICLES. THERE IS A CLEARLY ESTABLISHED NEED FOR RECHARGEABLE HIGH ENERGY CELLS AND BATTERIES FOR SPACE POWER TECHNOLOGY. THIS CALLS FOR MORE ENERGETIC LITHIUM SYSTEMS THAT HAVE BEEN STUDIED SO FAR, WITH PRACTICAL ENERGY DENSITIES IN EXCESS OF 250 WH/Kg. A NEW APPROACH IS PROPOSED TOWARDS AMBIENT TEMPERATURE HIGH ENERGY LITHIUM BATTERIES BASED ON TWO NEW KEY IDEAS. ONE IS TO USE REDUCIBLE CATHODES INSTEAD OF INTERCALATION MATERIALS AND THE OTHER TO EMPLOY INORGANIC ELECTROLYTES AS A BASIS FOR HIGH RATE CAPABILITY AND A GREATER LONG RANGE STABILITY. REDUCIBLE CATHODES OFFER HIGHER ENERGY AND POWER DENSITIES OVER A WIDER TEMPERATURE RANGE AND SHOULD BE CAPABLE OF LONGER CYCLE LIVES AS WELL. NEW CATHODES ARE PROPOSED BECAUSE OF THEIR PARTICULARLY HIGH ENERGY DENSITY AND LOW SOLUBILITY IN THE ELECTROLYTE WHICH WOULD BE THE BASIS FOR GREATER STABILITY NEEDED FOR A LONG CYCLE LIFE. THEORETICAL ENERGY DENSISITES IN EXCESS OF 1300 WH/Kg ARE INVOLVED IN THESE REDUCIBLE CATHODE SYSTEMS COMPARED TO ONLY 480-700 AVAILABLE FROM THE BEST INSERTION TYPES. THUS, THE PROPOSED PROGRAM REPRESENTS A NEW APPROACH AND A CLEAR DEPARTURE FROM RECENT TRENDS IN THIS FIELD.

INNOVATIONS SOLUTIONS FROM ADV TECH/ISAT
7375 BOSTON BLVD - STE 110
SPRINGFIELD, VA 22153
Program Manager: R T LEITNER
Contract #:
Title: A NOVEL APPROACH TO DEVELOPING A 600 WH/Kg RECHARGEABLE BATTERY
Topic #: N90-381 Office: NAPC ID #: 41731

A RECENT BREAKTHROUGH IN POLYMER BATTERY TECHNOLOGY NOW PERMITS A PRACTICAL, VERY HIGH ENERGY DENSITY, LONG LIFE SECONDARY BATTERY TO BE FABRICATED. THIS PROPOSAL DESCRIBES A PHASE I CONCEPTUAL DESIGN STUDY AND PRELIMINARY CELL EVALUATION. PHASE II WILL CULMINATE WITH THE DEMONSTRATION OF A PROTOTYPE 600 WH/Kg BATTERY.

PHYSICAL SCIENCES INC
20 NEW ENGLAND BUSINESS CTR
ANDOVER, MA 01810
Program Manager: DR MICHAEL B FRISH
Contract #:
Title: ADVANCED LASER SCANNER FOR 3-D VOLUMETRIC DISPLAY
Topic #: N90-382 Office: NOSC ID #: 41733

PSI PROPOSES A PHASE I EFFORT TO DESIGN A CUSTOM SCANNING APPARATUS THAT, WHEN ASSEMBLED IN PHASE II, WILL INCREASE THE DATA DISPLAY RATE OF THE NOSC THREE-DIMENSIONAL VOLUMETRIC DISPLAY BY AT LEAST ONE ORDER OF MAGNITUDE ABOVE ITS CURRENT CAPABILITIES. IN ADDITION, THE APPRATUS WILL PROVIDE A MULTI-COLOR CAPABILITY TO THE CURRENT MONOCHROME DISPLAY. DISTINCT COLORS WOULD FACILITATE DISTINCTION OF CRITICAL (I.E., RAPIDLY CHANGING) FROM NON-CRITICAL DATA. THE COMPLETION OF THE OPTICAL DESIGN IN PHASE I WILL DEMONSTRATE THAT SIGNIFICANT IMPROVEMENTS IN THE STATE-OF-THE-ART OF 3-D DISPLAY TECHNOLOGY, AND THE IMPLEMENTATION OF THESE IMPROVEMENTS IN PHASE II, ARE BOTH FEASIBLE.

AMERICAN RESEARCH CORP OF VA
PO BOX 3406
RADFORD, VA 24143
Program Manager: DR USHA VARSHNEY
Contract #:
Title: INTEGRATED PLANAR MAGNETIC DEVICES FOR MEGA-HERTZ FREQUENCY HIGH DENSITY POWER SUPPLIES
Topic #: N90-383 Office: NOSC ID #: 41821

RECENT DEVELOPMENTS IN VERY HIGH SPEED INTEGRATED CIRCUITS (VHSIC) HAVE LED TO THE NEED FOR HIGH EFFICIENCY AND POWER DENITY RESONANT MODE AND SWITCHED MODE POWER SUPPLIES, OPERATING AT FREQUENCIES IN EXCESS O 1 MEGAHERTZ (MHz). THE SPECIFICATIONS FOR THESE POWER SUPPLIES ARE STINGENT DUE TO REQUIREMENTS NECESSARY FOR RELIABLE POWER SOURCES. THESE REQUIREMENTS ARE DRIVING OPERATING FREQUENCIES TO GREATER THAN 1 MHz; HIGHER OPERATING FREQUENCIES RESULT IN REDUCED COMPONENT VOLUME. TO REDUCE POWER SUPPLY VOLUME, AMERICAN RESEARCH CORPORATION OF VIRGINIA SUGGESTS THE DEVELOPMENT OF PLANAR INDUCTORS AND TRANSFORMERS WITH REDUCED DEVICE LOSSES. THE INNOVATION CONTAINED IN THIS PROPOSAL IS THE DEVELOPOMENT OF A HOT ISOSTATIC PRESS (HIP) PROCEDURE TO DENSIFY PLASMA-SPRAYED FERRITE THICK FILMS CAPABLE OF OPERATING WITH LOW LOSSES AT HIGH OPERATING FREQUENCIES AND FLUX DENSITIES. THE PLANAR MAGNETIC COMPONENTS WILL BE DESIGNED TO BE COMPATIBLE WITH FLEXIBLE INTEGRATED CIRCUIT WINDINGS. TECHNICAL OBJECTIVES INCLUDE FABRICATION OF FERRITE POWDERS, DETERMINATION OF PLASMA SPRAY CONDITIONS, ESTABLISHMENT OF HIP PARAMETERS, CHARACTERIZATION OF MAGNETIC THICK FILMS AND DESIGN AND TEST OF INTEGRATED PLANAR

COMPONENTS AND DEVICES. THE SIGNIFICANCE OF THE PROGRAM IS DERIVED FROM THE REDUCED VOLUME, INCREASED EFFICIENCY AND HIGHER POWER DENSITY AFFORDED BY INTEGRATED PLANAR MAGNETIC CIRCUITRY.

MICROEXPERT SYSTEMS INC
24007 VENTURA BLVD - STE 210
CALABASAS, CA 91302
Program Manager: PAUL GRIFFITH
Contract #:
Title: AN ASSOCIATIVE NEURAL NET INTEGRATED CIRCUIT WITH ON-CHIP LEARNING
Topic #: N90-384 Office: NOSC ID #: 41823

MICROEXPERT PROPOSES TO BUILD AN ARAM FOR TRUE ASSOCIATIVE RECALL THAT COMBINES PROCESSING AND LEARNING ON A SINGLE INTEGRATED CIRCUIT CHIP. DURING PHASE I WE WILL EVALUATE SEVERAL RELEVANT NEURAL NETWORK PARADIGMS, EXOTIC MATERIALS, DEVICE TYPES, AND ARCHITECTURES. WE WILL MODEL THE STORAGE CELL IN SOFTWARE TO DETERMINE SUCH CIRCUIT PERFORMANCE PARAMETERS AS ACCESS TIME, RETENTION TIME, AND DYNAMIC RANGE/ERROR CHARACTERISTICS. IN PHASE II WE WILL IMPLEMENT OUR DESIGN IN INTEGRATED CIRCUIT FORM, TAKING ADVANTAGE OF STANDARD SEMICONDUCTOR PROCESSING CAPABILITIES FOR LOW COST. OUR PERFORMANCE GOAL WILL BE 10(11) - 10(12) INTERCONNECTS/SEC. SINGLE CHIP, ON- CHIP LEARNING CAPABILITY COMPRISES THE MAJOR INNOVATION OF THE PROJECT, THOUGH SOME OF THE CIRCUIT DESIGN TECHNIQUES REPRESENT ANOTHER LEVEL OF NOVELTY. MICROEXPERT WILL BE SUPPORTED IN THIS ENDEAVOR BY SAIC, WHICH IS DEVELOPING A SIMILAR SINGLE ON-CHIP LEARNING IC.

ADVANCED ROTORCRAFT TECHNOLOGY INC
1804 N SHORELINE BLVD
MOUNTAIN VIEW, CA 94043
Program Manager: OFER BRUHIS
Contract #:
Title: HELICOPTER ROTOR DISK AND BLADE ELEMENT COMPARISONS
Topic #: N90-385 Office: NATC ID #: 41825

MODERN COMPUTER TECHNOLOGY OFFERS THE CAPABILITY TO PERFORM REAL-TIME PROCESSING OF MATHEMATICAL MODELS FAR MORE SOPHISTICATED THAN THOSE CURRENTLY BEING UTILIZED IN TRAINING APPLICATIONS. THE CAPABILITY TO COST EFFECTIVELY IMPLEMENT BLADE ELEMENT ROTOR MODELS IN REAL TIME USING MULTIPROCESSOR ARCHITECTURES AND RISC TECHNOLOGY PROCESSORS HAS BEEN DEMONSTRATED. IN ORDER TO EFFECTIVELY UTILIZE THIS NEW COMPUTATIONAL CAPABILITY IT IS NECESSARY TO ASSES THE TRADE-OFFS BETWEEN INCRESED FIDELITY AND THE COST ASSOCIATED WITH ADDED SOPHISTICATION IN ROTORCRAFT MATHEMATICAL MODELING. THE OBJECTIVE OF THIS STUDY IS TO PERFORM OFF-LINE COMPARISONS OF BLADE ELEMENT AND ROTOR MAP MODELS UNDER OTHERWISE IDENTIFICAL CONDITIONS TO ASSESS THE SIGNIFICANCE OF THIS INCREASED SOPHISTICATION TO SIMULATION FIDELITY AND TO WEIGH IT AGAINST THE ADDITIONAL COST ASSOCIATED WITH THE INCREASED COMPUTATIONAL REQUIREMENTS. THE COMPARISON WILL BE CONDUCTED USING THE FLIGHTLAB SYSTEM TO PROVIDE A MODULAR APPROACH TO REPLACING ONLY THE ROTOR MODEL IN A CONFIGURED SIMULATION. BLADE ELEMENT MODELS WILL BE COMPARED WITH ROTOR MAP MODELS AND AVAILABLE FLIGHT TEST DATA FOR BOTH THE MAIN AND TAIL ROTORS OF A UH-60 BLACK HAWK. COMPARISONS OF TRIM, STATIC STABILITY, TRANSIENT RESPONSE AND FREQUENCY RESPONSE WILL BE USED TO EVALUATE THE MODELS. HANDLING QUALITIES COMPARISONS WILL BE MADE USING THE NEW ADS33C HELICOPTER HANDLING QUALITIES SPECIFICATIONS. COMPARISONS WILL BE MADE BOTH FOR NOMINAL FLIGHT CONDITIONS AND AGGRESSIVE, EDGE-TO-THE-ENVELOP MANEUVERS.

QUINTRON CORP
3901 CENTERVIEW DR
CHANTILLY, VA 22021
Program Manager: J R TOLER
Contract #:
Title: HELICOPTER SIMULATOR ROTOR DISK AND BLADE ELEMENT COMPARISON
Topic #: N90-385 Office: NATC ID #: 41824

EARLY (1955-1970 VINTAGE) HELICOPTER OFTs USED SIMPLIFIED BLADE ELEMENT MATH MODELS FOR CALCULATING ROTOR FORCES AND MOMENTS. THE COMBINATION OF INACCURATE ASSUMPTIONS IN THE MODELS AND COST/ PERFORMANCE LIMITATIONS OF AVAILABLE COMPUTATIONAL SYSTEMS SOON FORCED DESIGNERS TO ABANDON THE BLADE ELEMENT APPROACH IN FAVOR OF OVERALL ROTOR DISK MODELLING TECHNIQUES. TODAY'S INEXPENSIVE, YET MORE POWERFUL MICROPROCESSORS, OFFER THE OPPORTUNITY OF RECONSIDERING THE BLADE ELEMENT APPROACH WITHOUT RETENTION OF THE INACCURATE ASSUMPTIONS AND WITHOUT SEVERE COST PENALTY. THIS COULD PROVIDE A SIGNIFICANT ENHANCEMENT IN THE FIDELITY OF STATIC AND DYNAMIC ROTOR/MODELLING, COMPARED TO THE BEST THAT CAN BE DONE USING OVERALL ROTOR CALCULATIONS. QUINTRON'S ROTATING BLADE ELEMENT MODEL WILL BE RETROFITTED ON TWO USMC CH-53E OFTs, THEREBY OFFERING AN IDEAL OPPORTUNITY FOR COMPARISON OF PERFORMANE WITH THE EXISTING OVERALL ROTOR MODEL. BOTH MODELS WILL HAVE BEEN VALIDATED BY TEST PILOTS FROM NATC PATUXENT RIVER AND ACCEPTED BY THE NAVAL TRAINING SYSTEMS CENTER.

SANDIA RESEARCH ASSOCS INC
PO BOX 2545
CORRALES, NM 87048
Program Manager: STEVEN M SHOPE
Contract #:
Title: A SPREAD SPECTRUM DEEP WATER PINGER SYSTEM
Topic #: N90-386 Office: NATC ID #: 41827

HIGH-VALUE TEST ITEMS ARE OFTEN LOST IN OPEN-OCEAN TEST AND PRACTICE RANGES. SUCH ITEMS INCLUDE WEAPONS, FLIGHT DATA RECORDERS, MISSILES, DRONES, AND MANNED TACTICAL AIRCRAFT. THE LOSS OF VALUABLE TEST DATA CAN BE A SERIOUS PROBLEM. IN ADDITION, RECOVERY OF SOME ITEMS BY FOREIGN GOVERNMENTS NOT ONLY COMPROMISES WEAPON TECHNOLOGY, BUT CAN RENDER AN ENTIRE WEAPON SYSTEM SUSCEPTIABLE TO FOREIGN COUNTER-MEASURES. THIS PROPOSAL DESCRIBES A PHASE I SBIR PROJECT THAT WILL DEMONSTRATE THE FEASIBILITY OF AN ADVANCED UNDERWATER LOCATION DEVICE THAT USES SPREAD SPECTRUM SIGNAL CODING. CONVENTIONAL UNDERWATER LOCATION DEVICES, OR PINGERS, EMIT A PERIODIC ACOUSTIC PULSE WHICH IS DETECTABLE BY ANYONE WITH A ULD RECEIVER. WE PROPOSE TO REPLACE THE ACOUSTIC PULSE WITH A PSEUDO-NOISE, SPREAD SPECTRUM SIGNAL. DETECTING THIS SIGNAL REQUIRES AN EXACT REPLICA OF THE TRANSMITTED CODE. TO AN UNAUTHORIZED OBSERVER WITHOUT THE REPLICA, THE BEACON'S SIGNAL IS INDISTINGUISHABLE FROM BACKGROUND OCEAN NOISE.

UNDERSEA SYSTEMS TECHNOLOGY CORP
5793 WIDEWATERS PKWY
DEWITT, NY 13214
Program Manager: CHARLES CLARKSON
Contract #:
Title: DEEP WATER PINGER LOCATOR SYSTEM
Topic #: N90-386 Office: NATC ID #: 41826

ACOUSTIC LOCATOR BEACONS OPERATE AT FREQUENCIES WHERE SIGNIFICANT SIGNAL ATTENUATION TAKES PLACE AS A RESULT OF THE ABSORPTION OF ACOUSTIC ENERGY BY SEAWATER. THIS PUTS A HARD

UPPER LIMIT ON THE RANGE OF DETECTION FOR A SIMPLE LOCATING RECEIVER. FOR EXAMPLE, TO EXTEND DETECTION FROM 1.5 TO 3 NAUTICAL MILES, ABOUT 30 dB MORE SIGNAL ENERGY AT THE RECEIVER IS NEEDED. SOLUATIONS FOR LONGER RANGE DETECTION MUST ACHIEVE AS MUCH GAIN AS COST-EFFECTIVE IMPLEMENTATION WILL ALLOW. UST PROPOSES TO INVESTIGATE SYSTEMS WHICH PROVIDE 20 TO 40 dB IMPROVEMENT IN THE ACOUSTIC DETECTION PROCESS WITH A NOVEL AND INEXPENSIVE ARRAY RECEIVER, AND TO INVESTIGATE THE IMPLEMENTATION OF THIS IMPROVED RECEIVER IN A CONFIGURATION WHICH LENDS ITSELF TO A VARIETY OF OPERATIONAL DEPLOYMENTS.

PACIFIC-SIERRA RESEARCH CORP
12340 SANTA MONICA BLVD
LOS ANGELES, CA 90025
Program Manager: DR TILL LIEPMANN
Contract #:
Title: DYNAMIC LASER THREAT ILLUMINATION SYSTEM DESIGN STUDY AND PROOF OF CONCEPT DEMONSTRATION
Topic #: N90-387 Office: NATC ID #: 41828

PSR WILL PRODUCE A DETAILED DESIGN AND SMALL SCALE BRASSBOARD PROOF OF CONCEPT HARDWARE VERSION OF A DYNAMIC LASER THREAT ILLUMINATION SYSTEM (DLTIS). THE PROPOSED DLTIS WILL BE CAPABLE OF ILLUMINATING FULL SIZE AIRCRAFT WITH LASER RADIATION AT VARIOUS WAVELENGTHS (E.E. 514, 532, 904, 1064 AND 10600 nm). FOR SIMPLIFIED SAFETY AND SECURITY, THE SYSTEM WILL OPERATE INSIDE A HANGAR OR SIMILAR ENCLOSED SPACE. THE SYSTEM WILL HAVE CONTINUOUSLY VARIABLE LASER OUTPUT POWER, PULE WIDTH, PULSE CODE, DIRECTION OF ARRIVAL AND BEAM DIVERGENCE. THE SYSTEM WILL BE UNDER COMPUTER CONTROL, WITH THE CAPABILITY OF ILLUMINATING THE AIRCRAFT WITHA PREPROGRAMMED AND STORED SEQUENCE OF EVENTS. THESE SEQUENCES CAN BE REPLAYED ANY NUMBER OF TIMES, AND THE EXPOSURES WILL BE MONITORED BY THE SYSTEM. THE ENTIRE SYSTEM WILL BE MOBILE AND MODUALR, ALLOWING FOR VARIABLE ANGLE OF ARRIVAL AND EASE OF MAINTENANCE AND CHNGE TO SUIT NEW WAVELENGTHS. PSR HAS HAD EXTENSIVE EXPERIENCE IN BUILDING SIMILAR LASER SYSTEMS FOR DOD CUSTOMERS, HENCE OUR PHASE I PROPOSAL INCLUDES PRODUCING A SMALL SCALE LABORATORY BRASSBOARD PROOF OF CONCEPT DLTIS. THIS BRASSBOARD WILL BE BUILT UP FROM CAPITAL EQUIPMENT CURRENTLY AVAILABLE IN PSR'S ELECTRO-OPTICS LABORATORY AND WILL NOT ADD MATERIALS COST TO THIS PHASE I EFFORT.

CONCEPT DEVELOPMENT ASSOCS (CDA)
1227 NINTH ST
MANHATTAN BEACH, CA 90266
Program Manager: DR NAHUM GAT
Contract #:
Title: WIDE-BAND IMAGING SPECTRORADIOMETER SYSTEM DEVELOPMENT
Topic #: N90-388 Office: NATC ID #: 41829

IMAGING SPECTRORADIOMETERS COMMONLY USE A POLYCHROMATOR TYPE INSTRUMENT IN CONJUNCTION WITH AN IMAGING ARRAY. SUCH INSTRUMENTS ARE LARGE IN SIZE AND WEIGHT, AND REQUIRE DELICATE ALIGNMENT OF THE DISPERSION ELEMENT IN RELATION TO THE ARRAY. A NOVEL CONCEPT USES NO DISPERSION ELEMENT BUT A PROPRIETARY ANAMORPHIC OPTICAL SYSTEM, AND A SPECIAL DATA REDUCTION ALGORITHM, PRODUCES A PERMANENTLY ALIGNED, ALL SOLID-STATE, SPECTRUM RESOLVING SENSOR WHICH CAN BE ADAPTED FOR USE IN EXISTING FLIR SYSTEMS. THE TECHNIQUE CAN BE ADAPTED TO A SINGLE ELEMENT DETECTOR, LINE ARRAY, OR AREA ARRAY FLIR. SPECTRAL RESOLUTION FROM SEVERAL HUNDREDS TO SEVERAL THOUSANDS IS ACHIEVABLE WHILE THE ACTUAL OPERATING RESOLUTION IS SOFTWARE SELECTABLE AND MAY BE VARIED IN REAL-TIME. THE OBJECTIVES OF PAHSE I ARE TO DEVELOP A LIST OF PERFORMANCE AND OPERATIONAL REQUIREMENTS, TO PERFORM DESIGN TRADE-OFFS, TO DESIGN AND SPECIFY THE SUBSYSTEMS AND COMPONENTS, AND TO

PREPARE A HARDWARE DEVELOPMENT PLAN FOR PHASE II. THE SYSTEM IS DESIGNED TO UTILIZE COMMERCIAL FLIR COMMON MODULES, AND IS VIDEO INTERFACED WITH TO MICRO-COMPUTER FOR REL-TIME IMAGE OPERATIONS SUCH AS ELETRONIC ZOOM, SPOT SPECTRUM OR TEMPERATURE READOUT, ISOTHERMS OR ISO-WAVELENGTH IMAGES, IMAGE AVERAGING, FILTERING, REGION-OF-INTEREST OPERATIONS, ETC. PHASE II WILL CONSIST OF BREADBOARD DESIGN VERIFICATION AND DEVELOPMENT SYSTEM FOLLOWED BY PROTOTYPE FABRICATION AND DEMONSTRATION.

OPTRON SYSTEMS INC
3 PRESTON CT
BEDFORD, MA 01730
Program Manager: FRANK L LEARD
Contract #:
Title: PORTABLE SCANNING WIDEBAND IMAGING SPECTRORADIOMETER
Topic #: N90-388 Office: NATC ID #: 41830

THE OBJECTIVE OF THIS RESEARCH PROGRAM IS TO DEVELOP A PORTABLE, RAPID-SCANNING WIDEBAND IMAGING SPECTRORADIOMETER (SWIS) TO ADDRESS THE NEED FOR A REAL-TIME INSTRUMENT THAT CAN SIMULTANEOUSLY OBTAIN BOTH IMAGING AND SPECTRAL DATA IN THE 1 TO 12 um WAVELENGTH RANGE. OPTRON'S TECHNIQUE USES PASSIVE DISPERSIVE OPTICAL ELEMENTS (GRATING AND LENSES) TO SPECTRALLY SEPARATE THE INCIDENT RADIATION, WHILE PRESERVING IMAGE RESOLUTION. THIS SPECTRAL IMAGE CONTINUUM IS FOCUSSED SIMULTANEOUSLY ONTO LINEAR SPATIAL LIGHT MODULATORS, WHICH SELECT THE SPECIFIC NARROW-BAND SPECTRAL REGION TO BE EXAMINED. THE FILTERED WAVELENGTHS OF INTEREST ARE THEN DISPERSION COMPENSATED AND REIMAGED ONTO THE APPROPRIATE IMAGING DETECTORS (E.G., CCD CAMERAS) BEFORE BEING DOWNLOADED TO AN ELECTRONIC COMPUTER FOR POST PROCESSING. IN ITS ULTIMATE FORM, THE DEVICE CAN COVER THE WAVELENGTH RANGE BETWEEN 1 um AND 12 um, PROVIDE WAVELENGTH SWITCHING IN < OR - um, AND BE CAPABLE OF LINEAR OR RANDOM SPECTRAL SCANNING. THIS TECHNIQUE HAS THE ADVANTAGES OF HIGH-SPEED SWITCHING, BROAD-WAVELENGTH BAND COVERAGE, LOW-POWER CONSUMPTION, MEDIUM-VOLTAGE CONTROL (< OR - 500V), AND RELATIVELY REASONABNLE MANUFACTURING COST DUE THE USE OF STANDARD PASSIVE AND ELECTRO-OPTIC MATERIALS. THE DEVICE SCANS ELECTRO-OPTICALLY AND HAS NO MOVING PARTS.